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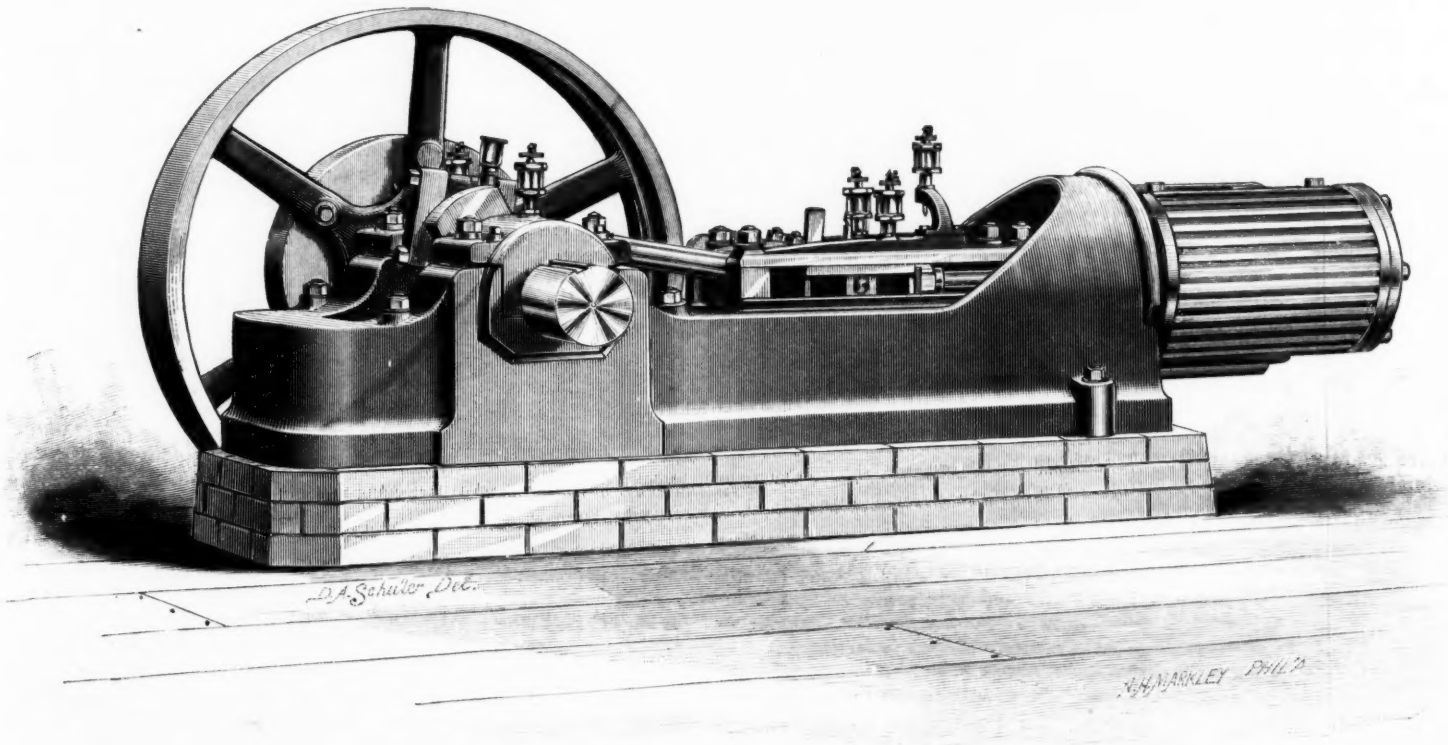
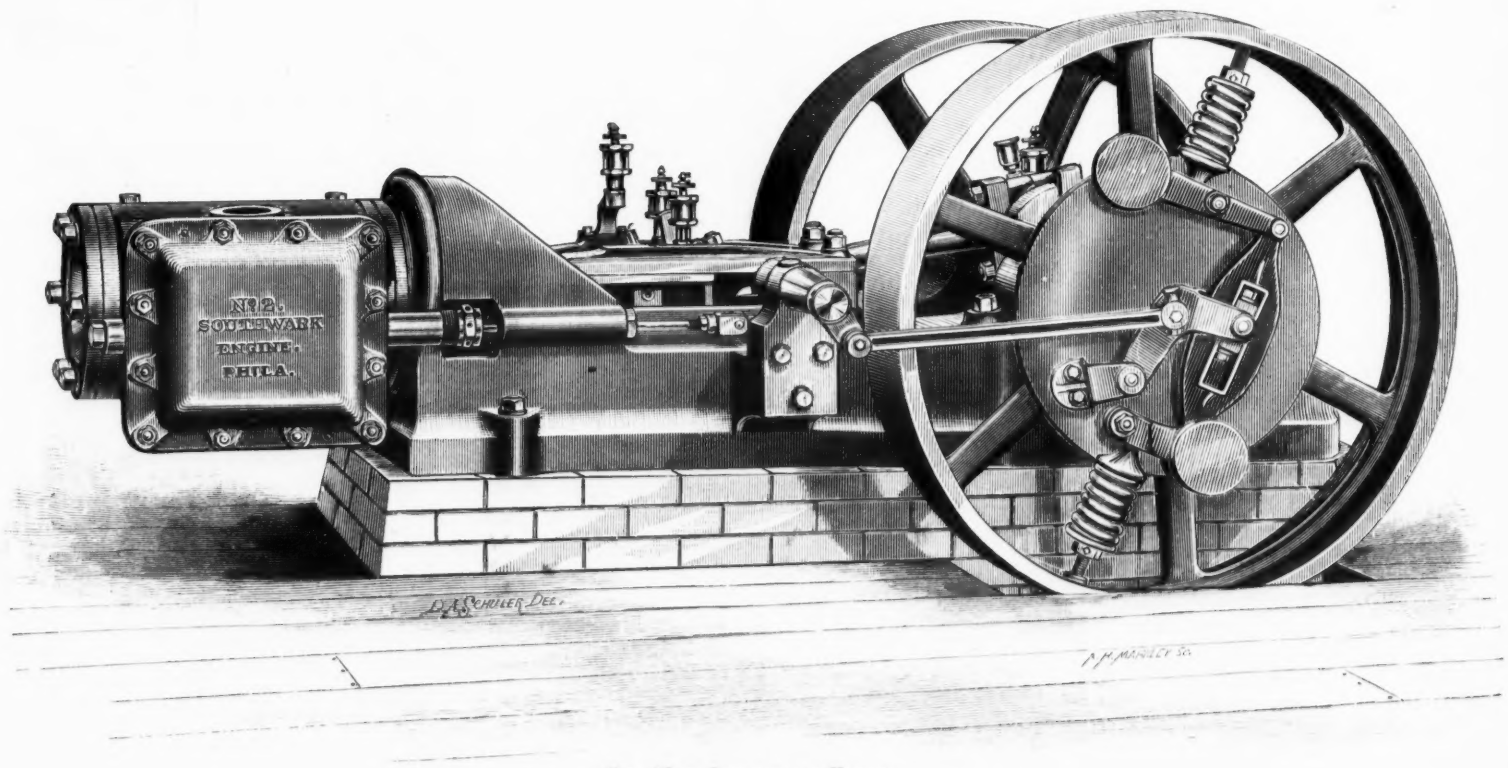
## The Southwark Engine and the Large Porter-Allen Engine at Scranton.

The engravings on this page represent a new engine, designed by C. B. Richards, and manufactured by the Southwark Foundry and Machine Company, Philadelphia, Pa. It is designed for use where from 20 to 100 horse-power is required, and where an engine combining strength and simplicity with good economy in the use of steam and close regulation, but cheaper in first cost than the Porter-Allen engine manufactured by this company, is wanted.




THE NEW SOUTHWARK ENGINE.

It is "automatic," having the governor within the fly-wheel. The centrifugal force of weighted arms, resisted by spiral springs, operates a lever, which gives to the valve, movements of varying extent, by which the point of cut-off is varied. There is no eccentric; a simple hardened steel wrist-pin taking its place. This steel pin is attached to the lever, which the governor weights operate, and its action is like that of a crank with a short but variable throw, whose movements are the same as those which an eccentric would communicate if it were applied to the shaft and acted upon by the governor.

Instead of four valves, this engine has but a single one, through which steam enters and leaves the cylinder. This is a flat slide valve with a cover plate which relieves it entirely from the pressure of steam, and, as the valve seats are vertical, even the weight of the valve does not cause wear in a direction to produce steam leakage. By the flat parallel seats provision is afforded, through a slight adjustment of the covering plate, for stopping any leakage which may in time occur. There are no outer pillow blocks for the main shaft separate from the engine bed, the bed being of the general form designed by Mr. Porter several years ago for self-contained Porter-Allen engines.

The main crank-shaft is made in one piece, forged solid throughout. It rests in bearings sunk in the bed-plate and firmly sustained, the side boxes being adjustable by means of wedges.

The pulley on one end of the shaft contains the governor, and serves also as a driving pulley and fly-wheel, but a second pulley can be applied to the other end of the shaft, which projects to receive it. While these engines are cheaper than more elaborate engines, they are thoroughly well built in every particular.

The engraving of the Porter-Allen engine, page 2, represents the one built by the same company for the Lackawanna Iron and Coal Company, who have kept it in constant use for about a year in one of their mills at Scranton, Pa., where it is driving, through direct connection—that is to say, without intermediate gearing of any kind—a "three high" train of 36 inch rolls for rolling steel ingots into blooms.

As can be seen from the engraving, this engine is massive, and admirably calculated to withstand the enormous strains it is subjected to, which are occasioned by the shocks which the peculiar kind of work required of it gives rise to.

The engine has a cylinder with a bore 44 inches diameter, and a stroke of 5½ feet. It was started at 45 revolutions per minute, but is of suitable proportions to work well at 70 revolutions, at which speed, and with 80 pounds' steam pressure, the engine will develop over 2,000 horse-power. At present, however, it is worked up to little more than half the power it is capable of developing.

The following extract from a letter from Mr. W. F. Mattes, chief engineer of the Lackawanna Iron Company, gives particulars respecting this engine's performance and the capacity of the train it is attached to, which are interesting:

"The steel ingots rolled, when intended for 60-pound rails, are 12½ inches square at top by 14½ inches square at bottom, by 6 feet long, and are reduced to blooms 7 inches square in 12 passes. We have never blown sufficient steel to discover the ultimate capacity of the train, but it probably would be reached in the neighborhood of 5,000 tons per week. With 65 pounds boiler pressure the engine develops ample power, and the regulation under the abrupt changes from zero to full power is very satisfactory."

Some of the principal proportions of the engine are as follows:

Space occupied—Length, 45 feet; width, 22 feet. Diameter of flywheel, 30 feet; diameter of crank disk, 8 feet; diameter of crank shaft, 25 inches. Greatest width of bed plate, 7½ feet. The nearly flat top of the bed is about 6 feet wide for a considerable part of the length.

The total weight is 140 tons; and the weights of some of the heaviest parts are:

Flywheel, 48 tons; bed plate, 24 tons; cylinder, 14 tons; shaft, 12 tons; crank, 5½ tons; outer pillow block, 7½ tons.

## Balanced Slide Valves.

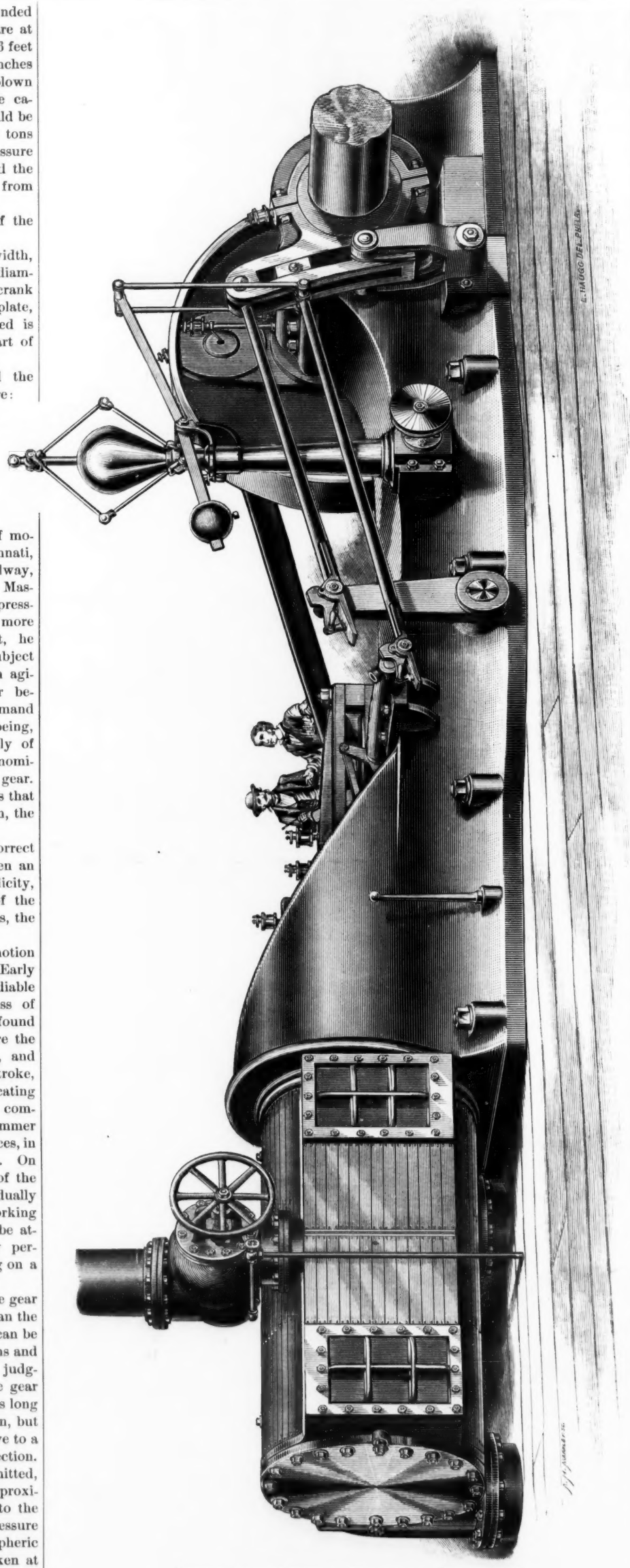
Mr. James Meehen, superintendent of motive power and machinery of the Cincinnati, New Orleans and Texas Pacific Railway, wrote the report on this subject for the Master Mechanics' Convention. After expressing regret at not being prepared to give more extended information on the subject, he said: Within the past five years the subject of valve motion and gearing has been agitated to a greater extent than ever before. This has grown out of the demand for higher speed, the aim apparently being, not only to furnish a greater supply of steam, but to use the steam more economically by means of improved valve gear. The result of efforts in this direction is that a substitute for, or an improvement on, the link motion has yet to be found.

While the link motion may not be a correct one for the distribution of steam, when an average is struck between its simplicity, durability and efficiency, and that of the various devices suggested as substitutes, the result is in favor of the link motion.

Many so-called faults of the link motion are the salvation of the locomotive. Early compression is often cited as an irremediable failing, and the belief exists that loss of power results therefrom. It has been found in high-speed stationary engines, where the clearance is reduced to a minimum, and compression commences late in the stroke, that the sudden arrest of the reciprocating parts in so small a distance by the compressed steam acts like a sledge hammer blow, and has resulted, in many instances, in the practical destruction of the engine. On the other hand, the early compression of the link motion gives a soft cushion, gradually arresting the momentum of the working parts—an advantage to which may be attributed the remarkably satisfactory performance of many locomotives running on a rough track.

There may be other forms of valve gear productive of more steam economy than the link, but until such superior economy can be obtained with equal simplicity of means and inexpensiveness of operation, in my judgment the link will be the only valve gear used. The defect of wire drawing has long been admitted against the link motion, but long ports and the use of the Allen valve to a great extent have obviated this objection. Diagrams of indicator cards were submitted, which showed a remarkably close approximation of initial pressure in cylinders to the boiler pressure, and the line of back pressure came exceedingly close to the atmospheric line. These indicator cards were taken at speeds varying from 126 to 276 revolutions per minute, and their uniform excellence gave clear proof that, with a properly-arranged motion, back pressure could be reduced to a minimum.

The life of the link motion is largely a question of adequate bearing surfaces, the truth of which any railroad mechanic will readily admit. When the link had a face of but 2 inches driving valves over ports 16 or 17 inches long, they wore rapidly, but when links having a face of 2½ to 3 inches were used to drive the same valves the wear was greatly reduced.



PORTER-ALLEN ENGINE AT SCRANTON.—(See page 1.)

The use of large cylinders and valves of late years has made the balancing of the latter a necessity. Unbalanced valves have been frequently known to cut ¼ inch from the seat in 100 miles running, while it is common to face an unbalanced valve every two weeks if the surfaces are not composed of first-class metal, as is very liable to happen in the construction of a cylinder. As an example of this, we had two engines in service on the Cincinnati Southern Railway that had to be faced up once a week until we introduced the Margach balanced valve, since which time they have given us but little trouble, except in fastening the balance to the valve proper. Hence, in my opinion, the necessity is unquestionable of balancing locomotive valves of present construction.

The question of lubricating valves is as much a necessity as that of balancing, and the only rational means of lubrication is a constant flow of oil in small quantities.

While free to admit that cylinders constructed with proper iron in valve seat and valve, receiving necessary attention from man in charge, have given a service of eight to ten months without facing, the great majority of our engines require facing of valves in less than five months.

We have in use the Margach and the Richardson balanced valves, both of which are good, but the Richardson valve has given decidedly the least trouble. While I do not consider either of them perfect, I beg to ask your consideration of both with a view to obtain a perfect balanced valve.

The proportion of valve lap is made to vary largely by different master mechanics. We have found the best results from passenger engines with $\frac{7}{8}$ inch outside, and line and line inside, with 5½ inches travel of valve, and with the same dimensions of valve for freight engines, but having ¼ inch inside lap. Some of our divisions have grades 60 feet to the mile and curves of 6 degrees.

I have no doubt but that there are many members of this association who, like myself, at some time of their lives have run locomotives, and such will agree with me in the following observations: In the manipulation of all classes of locomotives built in the United States, of which I have had more or less experience, I have never found a boiler to generate steam sufficient to work the cylinders up to full capacity under all circumstances. A heavy percentage of accidents have occurred on railroads from this cause, leaving engines stalled on grades' doubling, etc., in one day with a train they might pull on another occasion. This, in my opinion, is invariably caused by the boiler being too small, based on a scale assumed to be in proportion to size of cylinder.

When an engineer finds himself in a tight place with a heavy train, and the boiler fails to give the necessary pressure, he will cut off the supply of water, and, should he succeed in getting over his difficulty, he is compelled to call on a heavy water supply to overtake what he has lost. This has always a cooling effect on the boiler, and operates against the steam-generating qualities until a high-pressure temperature is again reached, incapacitating the engine, in the meantime, for its maximum work.

I believe that the too small proportion of size of the boiler to cylinders given by mechanical engineers, is caused by their objection to elevating the center of gravity, their endeavor being to keep the weight of the engine as low down as possible. In many cases this prevents them from making the boiler sufficiently large to obtain the capacity required, and this defect is apparent in most of the engines constructed at the present day and which are pulling heavy trains.

In case of a spring hanger breaking, the boiler would drop down on the revolving driving wheels, but by elevating the boiler—which in my judgment is not objectionable—this difficulty can be overcome, and a boiler of sufficient capacity could be provided, to supply the cylinders with steam under all circumstances.

We have now in service eight locomotives of this description, with 18x24-inch cylinders, the cylindrical part of the boiler having a diameter of 54 inches. The center of this boiler is 7 feet 3 inches, and the crown 9 feet 6 inches above top of rail. We are able to get 1,457 square feet of heating surface from the boiler, and any engine will maintain a pressure of 145 pounds with poor quality of coal. They are doing remarkably good work,

pulling local trains of six or eight cars between Cincinnati and Chattanooga, a distance of 339 miles, making eighty stops and dead time fifty minutes, in eleven hours and forty minutes; and it is a common occurrence to make up forty minutes. This is remarkable work, considering the grades and curvature of the road.

### The New Whitney Planing Machine.

The engraving represents a new wood-planing machine, brought out by Baxter D. Whitney, Winchendon, Mass. This is a very heavy and substantial machine of its class.

The table is supported on long inclined surfaces, and is raised or lowered by motion imparted to these inclines by means of a screw, the proportions being such that one revolution of the hand-wheel on the end of screw raises or lowers the table one-eighth of an inch.

Four feed rolls are used, each five inches diameter. The upper rolls are held down by weights, and all are driven by strong gearing, providing a powerful feed that carries the lumber entirely through the machine. The feed has two changes of speed, and is arranged to stop and start instantly.

The cylinder is made of hammered cast steel, with journals $1\frac{3}{4}$ inches diameter and $7\frac{3}{4}$ inches in length, belted at each end. In planing different thicknesses, the position of the cylinder is not changed; consequently, no change is required in driving belts. Capped or double irons are used, to insure smooth work on cross-grained lumber.

By the use of the new self-adjusting pressure bars, a pressure is brought on the lumber at the nearest possible line to the cut, one bar being used at each side of the cylinder, and always retaining its relative position without regard to inequalities of surface or depth of cut. By this means it is said that stuff less than three inches in length can be planed without "clipping" the ends.

The sizes of this machine vary by two inches from 24 inches to 48 inches in width, and lumber can be planed from $\frac{1}{16}$ inch to $6\frac{1}{2}$ inches in thickness. Every machine is thoroughly tested in actual work before leaving the works.

The Manhattan Railroad Company is a curiosity among corporations. It never built any part of the railroads, and all the equipment it ever bought was one flat car. No money was ever put into it, yet it represents $13,000,000 of stock, and its name is placed upon most of the rolling stock belonging to the elevated roads.

An industrial contemporary, whose complete name indicates that it is devoted to several staple materials, some hard and some soft, complains in an editorial that, when its canvasser goes into a large manufacturing town, he is likely to leave it with a sense of its being a poor town financially. But if Barnum's circus follows every one feels rich at once, and the showman scoops several thousand dollars' profit before going to the next town. The remark is certainly complimentary to Barnum, who has long had the reputation of knowing how to please people, and the enterprise to put forth all requisite efforts to do so. What appears strange to us is that a circus should interfere with the progress of an industrial newspaper. After all, it is merit that attracts and achieves success, whether in a circus or in a journal devoted to manufacturing interests. And when money circulates less actively, and greater economy is practiced, real merit is sought after with closer discrimination.

A boy in North Easton, Mass., who is too lazy to wind up his Connecticut watch in the usual way, puts the stem on the banister and rolls it along as he goes up the stairs to bed. When he reaches the top of the stairs, the watch is found to be wound. That boy has genius. He will probably be an inventor.

### Melting Iron in England.

We take the following account of melting iron in a Stewart cupola four feet diameter, length of shell nineteen feet, from *Iron:*

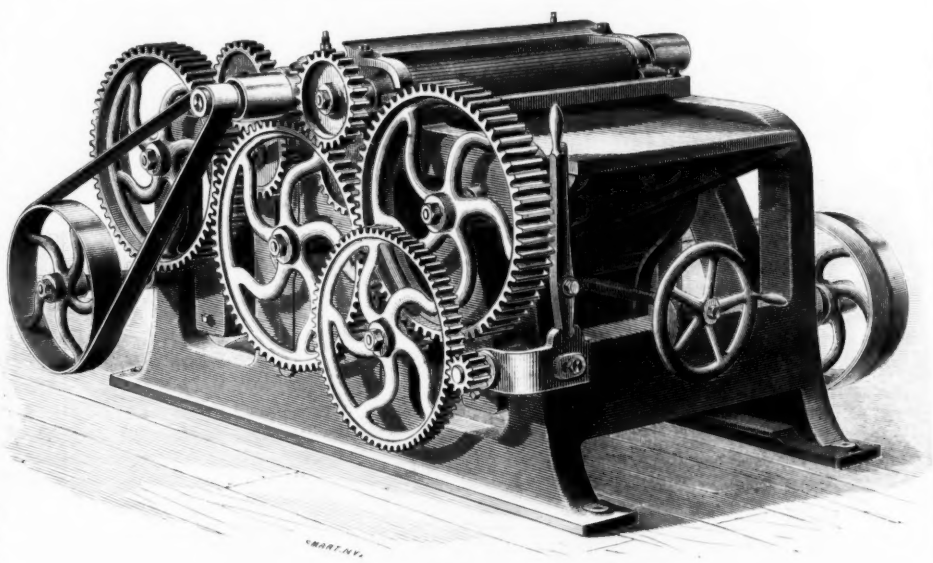
| | Time. | Charge of Coke. | Charge of Iron. | No. 3 Roots Blower. Speed of Blower. | Pressure of Water. | Time when taken. |
|---|---|---|---|---|---|---|
| | A. M. | Lbs. | Lbs. | Revolutions. | Inches. | |
| Time of lighting fire | 10:00 | Bed 336 | 1,792 | 425 | 37 | 1.10 |
| Put in coke for bed of cupola | 10:30 | " 112 | 2,016 | 430 | 32 | 1.40 |
| Making up of door | 11:00 | " 112 | 2,016 | 425 | 29 | 2.15 |
| Commenced charging | 11:05 | " 112 | 2,016 | | | |
| | P. M. | | | | | |
| Filled up cupola | 12:30 | " 112 | 2,016 | | | |
| Commenced blasting | 1:05 | " 112 | 2,016 | | | |
| Metal running down | 1:15 | " 112 | 2,016 | | | |
| Took away first metal in thirty-five minutes after blasting | 1:40 | " 112 | 2,016 | | | |
| 2d metal taken | 2:15 | 1,232 | 17,920 | | | |
| 3d " " | 2:30 | | | | | |
| 4th " " | 2:35 | | | | | |
| Finished charging | 2:15 | | | | | |
| Finished blasting | 2:35 | | | | | |

| | |
|---|---|
| Fuel used for bed coke | 336 pounds. |
| Fuel used for fusion coke | 896 " |
| Total consumption of fuel | 1,232 pounds. |
| Amount of iron melted in cupola | 17,920 pounds. |

REMARKS.—This was a melting of eight tons of iron with 1,232 pounds of coke in one hour and a-half, time from starting to finishing blasting. The time taken to melt the iron after having taken away the first ladleful of metal from receiver to taking away last metal was only fifty-five minutes.

NOTE.—14.54 pounds of iron to one pound of coke.

NOTE.—Coke used, exclusive of bed, 896 pounds, and amount of iron melted 17,920 pounds, or one hundred-weight of coke per ton of iron.



THE NEW WHITNEY PLANING MACHINE.

### Early Engineering Reminiscences.

BY GEORGE ESCOL SELLERS.

THIRD PAPER.

In writing these reminiscences, I do not propose a continued history of the early condition, the advance of the art and practice of civil and mechanical engineering, but merely to give such examples as may occur to me to illustrate what had to be contended with and overcome.

Should I dwell too long on the earlier periods that come within my own recollection, the excuse is that the better we make ourselves acquainted with the foundations, the better will we be able to appreciate the mighty structures that have been raised on them.

For several years prior to the organization of the Franklin Institute, of Pennsylvania, there was great interest and activity in what at that time was considered a rapid advance in mechanics, both in America and Europe.

The problem of ocean as well as land transportation was occupying the minds of many thinking men. Steam power was looked to, but was ridiculed as chimerical by the world at large. Our own Oliver Evans, from the time of his first high-pressure engine in 1785 or 1786 to the time of his death in 1819, never lost an opportunity to impress on any listeners he could hold the feasibility of not only navigating our rivers, but crossing the ocean and continents by steam power.

As early as 1786 he petitioned the Legislature of Pennsylvania to grant him the exclusive right to use his improvements in flour mills, and also for *road wagons propelled by steam.* The act passed in 1787, granting him the right so far as flour mills were concerned; but no notice was taken of that part of his petition relating to steam wagons. In 1787 the Maryland Legislature granted him, his heirs and assigns, the exclusive right for fourteen years for his improvements, including the steam wagon. The term "locomotive," as now applied, had not at that time been suggested.

As a boy, I have often listened to Mr. Evans' earnest predictions as to land travel by steam. He said he had lived to see part of his prediction verified in steamboats—that high-pressure steam and light engines had made it practical on our western rivers, and would in time on good turnpike or tram road.

In speaking of the Pennsylvania Legislature, he called them "the assembled wisdom of the State, that could not see beyond their noses." They could see the grain go into the mill and come out flour, but as to a wagon being moved by any other power than the slow-moving ox, the horse, or mule, or being dragged by man power, was beyond their comprehension. He had asked no aid other than protection in case of success. It would cost them nothing, yet he had been treated with contempt little short of insult.

Of the grant from the State of Maryland he said the Hollingsworths, the Elliots, the Tysons, and others, were men of enterprise and progress, more so than the average of the time.

He was very severe in his denunciations of Benj. H. Latrobe, whom he blamed for a report on steam navigation he had made, in which he alluded to him (Evans) as a visionary, seized with steam mania, in conceiving and believing that boats and wagons could be propelled by steam to advantage; while he (Latrobe) demonstrated by figures that could not lie that the entire capacity would be required to carry the engines and fuel, leaving no available tonnage for freight or passengers. The B. H. Latrobe referred to was the father of the very eminent engineer, B. H. Latrobe, Jr., who carried to a successful termination one of the greatest of American enterprises—the Baltimore and Ohio Railway, and other important works. The elder Latrobe was an accomplished English architect and engineer, who designed and erected the first water works of Philadelphia, by which a steam engine on the Schuylkill River raised the water into a brick underground conduit, through which it flowed nearly a mile into a cistern in Centre Square, the site on which the new public buildings are now being erected. Over this cistern was the engine house, on the top of which, covered by a dome, was the reservoir or basin, to give head to supply the city with water through bored wooden pipes.

Mr. Evans frequently referred to his blasted hopes. He had succeeded in obtaining indorsements of Prof. Robert Patterson, David Rittenhouse, C. W. Peale, Nathan Sellers, and a number of others whose names I cannot recall, as to the feasibility of his plans. He was meeting with success in interesting parties of means, and was full of hope of demonstrating to the world that he was no visionary, when Mr. Latrobe's report proved too much for him to overcome, and he was obliged to abandon the project of demonstration by outside aid.

It is now about 66 years since I rode with my father and Oliver Evans from Philadelphia to a mill in Delaware county, Pa., in which the latter was putting in a set of his elevators, hopper bag, and flour press. Yet much of the conversation I listened to both in going and returning on that never-to-be-forgotten trip, is as fresh in my memory as if it had occurred but yesterday.

Mr. Evans had much to say on the difficulties inventive mechanics labored under for want of published records of what had preceded them, and for works of reference to help the beginner. In speaking of his own experience, he said that everything he had undertaken he had been obliged to start at the very foundation; often going over ground that others had exhausted and abandoned, leaving no record. He considered the greatest difficulty beginners had to encounter was want of reliable knowledge of what had been done.

Even at that early day Mr. Evans suggested and urged the formation of a Mechanical Bureau that should collect and publish all new inventions, combined with reliable treatises on sound mechanical principles, as the greatest help to beginners. He did not believe it could at that time be made self-sustaining, but it would be to the interest of mechanics, manufacturers and merchants to subscribe to its support.

Another subject discussed was the importance of a school to teach mechanical drawing. Mr. Evans made all his drawings full size on chalked boards; he had no confidence in working to scale with the character of labor to be had at that time. His drawing instruments consisted of a two-foot rule, straight edge, square and compass. His first designs were rough pencil sketches, not drawn to scale. To combine and reduce these full size working drawings and put them in shape to exhibit, he depended upon Frederick and John Eckstein, then copper-plate engravers in Philadelphia. I think he named at a later date William Kneass, who was also a copper-plate engraver, and a good draftsman, but of this I am not quite certain.

Mr. Evans gave an instance of the advantage, in fact, the importance of artistically finished drawings to the mechanic, by citing the Philadelphia water works. He said it was Latrobe's fine drawing he exhibited of the Bolton & Watt steam engine and pumps, and above all the exterior of the pumping house, with its Doric columns and pediments, both front and rear, its center dome-shaped building covering the reservoir, with the novel expedient of the stack and chimney, terminating on the apex of the dome, vomiting its wreath of black smoke, that caught the eye of the members of the city council that adopted the plans and gave to Latrobe the superintendence of the work. Mr. Evans called it the city plaything on which to expend money; more for ornament than utility, barely calculated to supply their wants without provision for a growing city, but he said that notwithstanding Latrobe had classed him among the visionaries, he would give him credit for having introduced a higher standard of

mechanical drawing that would stimulate our native mechanics, and in that respect they owed him much.

Boy as I was at the time, it did not occur to me that there might have been a dash of satire in Mr. Evans' allusion to Mr. Latrobe, or that he might have been a competitor with him in plans for the water works. I do not now know that he was or was not. Beside the Bolton & Watt condensing engine and pump in the old Centre Square Water Works there was an engine known as the "American Engine," a vertical cylinder, lever-beam engine, the original Oliver Evans' engine, and I presume built by him or under his supervision. This engine, if my recollection does not deceive me, was oftener seen running than the "great English engine," as it was then called.

In speaking of the water works, Mr. Evans said Philadelphia had paid dearly for rejecting a proposition of Nathan Sellers, who was then a member of the council, for the city to purchase the Fairmount hills and reserve them as a site for reservoirs when the wants of the city should require an extension of its water works, and he believed Mr. Sellers had spoken prophetically when he said to the council that he expected to live to see the Centre Square Water Works torn down. Mr. Evans said that about that time he was called before a committee of the council, and that he said to them: "As sure as there is a Heaven above us, it will not be long before the city must own the Fairmount hills regardless of cost." I infer from this that Mr. Evans must have had plans in connection with these hills that were not approved at the time the "Centre Square plaything," as he always called it, was adopted.

I will here add that one of the last visits Nathan Sellers paid to Philadelphia after his retirement in his old age to his place in the country, was to see the first stone removed in the destruction of the Centre Square building that he had so earnestly opposed erecting—not from any mechanical defects in the plan, but for inadequacy in supplying the requirements of a growing city.

The want of published mechanical works that Mr. Evans complained of so much did not begin to be supplied until some years after his death. It was not until 1825 that *Nicholson's Operative Mechanic*, so long a standard, was published in England, and the second American edition bears date of 1831. I do not know the date of the first. As late as 1831 I could not find on sale in either New York or Philadelphia a copy of Dr. Alexander Jamison's Mechanical Dictionary, then considered a standard work in England, and was obliged to import a copy through Cary & Lee, who ordered with my copy some extra ones, which they held a long time before finding purchasers.

I have dwelt longer on Oliver Evans than I intended, for I look back with pleasure at having been privileged to listen to the plans and predictions of so far-seeing a man.

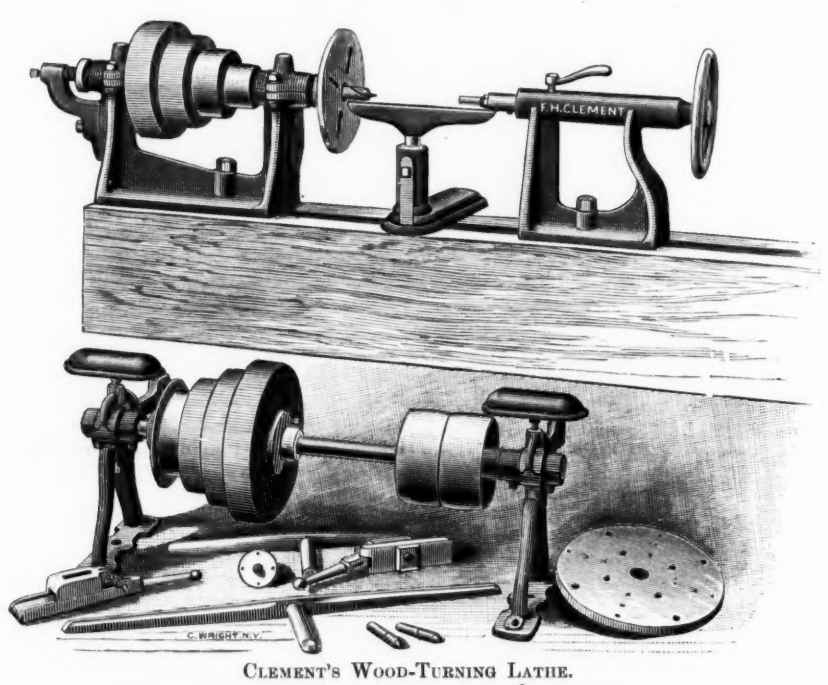
A good style of mechanical drawing was taught in Philadelphia long before the want of a mechanical publication was filled.

Wm. Mason, of the firm of Mason & Tyler, makers of philosophical instruments and small tools, taught a private class which I attended.

Wm. Strickland, as an architect, was always ready to lend a helping hand to young beginners. He would lend them drawings to copy and give kind advice. I recollect his once saying to me, "Come often and study the plates of my *Stewart's Athens;* copy them and recopy them; they are the foundation of sound principle and true taste."

Some really fine mechanical drawings of my earliest remembrance were made by a divinity student, at that time acting as draftsman at what I think was called the Eagle Foundry and Machine Shop. It was located on the Schuylkill River, near the foot of Callowhill Street. I do not remember who operated it, but it must have been short-lived, as for many years the great stone building stood vacant and idle.

This student was an accomplished and rapid pencil sketcher of machinery. That and music were passions with him. He spent two or three evenings a week at our house, kept a violin there, and joined my mother and others, of whom I may yet speak, in home concerts. He frequently brought his drawings to show to my father. On one occasion a finished colored drawing of a pair of bevel cog-wheels in gear, drawn in perspective, to my boyish eyes was a most wonderful piece of work, and, as a matter of course, I had many questions to ask. He then proposed, if I would devote my half-holidays (our Quaker schools gave two—one on meeting day, the other Saturday), he would teach me all he could. On this my father went with John, as we familiarly called him, and selected my fine case of drawing instruments, and with them, proud enough, I trudged away out to the foundry. I say "away out," for at that time it was through the suburbs and by the brick-ponds, on the margin of which I have more than once put up snipe and woodcock in what is now one of the best-built parts of Philadelphia. I profited by these lessons, for he was certainly the best mechanical draftsman of the time, and bid fair to make his mark as a mechanic had he not left its walks for what he considered a higher one—the Church. I was present at his ordination by Bishop White and heard his first public sermon. He was a loss to the mechanical world, but not a case of "spoiling a good mechanic to make a bad preacher," for he became eminent and world-wide known as John Henry Hopkins, Bishop of Vermont. He made no mistake in choosing his profession, whatever he may have done by his advocacy of domestic slavery, and his claim that it was justified by Holy Writ.




CLEMENT'S WOOD-TURNING LATHE.

### Clement's Wood-Turning Lathe.

In this lathe the spindles are of steel, carefully fitted. The tail screw has square thread and brass nut. The two small lifts of cone are of iron, and the larger ones of wood. The spur center has detachable center point, and the rosette center is made in two parts, so that the center screw can be quickly changed. The rear end of the head spindle runs in babbitt metal-bearing, and against a bronze step.

The cone may be regular or reversed, as shown. Screw clamps for rest socket and tailstock are furnished, by the use of which these parts may be tightened or loosened by one turn of a hand-wheel.

The parts that are furnished are: Head and tailstock, two sets of centers, three rests, two rest sockets, one rosette center, one face plate, countershaft and hangers and three clamps.

These lathes are made in three sizes, viz., 12 inch, 16 inch and 20 inch swing, by Frank H. Clement, Rochester, N. Y.

A genuine marble mantel, costing from $1,500 to $2,000, can be imitated in slate so perfectly, at a cost of from $40 to $50, that the most fastidious could have no choice between them. The process of marbleizing requires skill, but is comparatively inexpensive. The enameling is done on water and afterwards subjected for a time to heat, at a temperature of 300°; this makes it as hard as flint, bakes it into the slate, forming a smooth, bright, glazed surface, which is not acted on by acids or grease. The durability of this surface has scarcely been tested; marbleized mantels have been in use thirty-five years, without showing any signs of the surface cracking or wearing, or of its losing its color and luster.—*Slate Trade Journal.*

## LETTERS FROM PRACTICAL MEN.

### "Maintaining Mile a Minute Speed."

*Editor American Machinist:*

Under the above heading, in your editorial columns of June 7, 1884, you criticise the paper, "New York to Chicago in Seventeen Hours," read by me before the American Society of Mechanical Engineers at the Pittsburgh meeting, saying that it "displays very little knowledge of the real difficulties encountered in running fast trains."

Now, facts are the foundation of science, and they outweigh the profoundest and most ingenious speculations.

In June, 1876, the Pennsylvania Railroad Company ran a train, consisting of a baggage car, a smoking and "commissary" car, and the Pullman hotel car "Marlborough," hauled by one of their "Class C" locomotives (No. 573), having 17″ cylinders, 24″ stroke, and two pair of coupled wheels five feet diameter. The boiler had a total heating surface of 1,096 square feet, with a grate area of 17.6 square feet; and the run from Jersey City to Pittsburgh, a distance (*via* Mantua Station, Philadelphia) of 443.2 miles, was made in nine hours and fifty minutes, an average speed of forty-five miles per hour, the swiftest long-distance continuous run ever made in the world. The total weight of train, complete, was about 125 tons.

At the time this run was made, the roadbed was not in as good condition, nor was it as straight and level as it is at present; neither were the bridges in a condition to run over at a high rate of speed; and consequently the speed at times was as low as twenty-five miles an hour, especially over the bridge at Harrisburg, while it was in many parts over sixty miles per hour. Thus, from Princeton Junction to Trenton, the distance of nine and six-tenth miles was covered in nine minutes, or at the rate of sixty-four miles an hour.

The rate of miles per hour as shown above, taking into consideration the condition of the roadbed at that time, was extraordinary.

I cite the above case as an example of what can be done over a roadbed which has long and steep grades and numerous curves.

But there is a material difference between the state of things as existing then and at the present time. The roadbed has been very much improved, and a large number of curves and heavy grades removed. The stability of the bridges has also been increased, rigid curves changed to elastic ones, and the roadbed well ballasted, so that the average speed of the locomotives can be maintained without slowing up, as formerly.

On Saturday, June 7, 1884, the special newspaper train over the Baltimore and Ohio Road, conveying the Washington correspondents from the convention at Chicago, left the latter place at 2:10 P. M. (3:10 eastern time), and arrived at Washington at 2 o'clock Sunday afternoon, making the run of 813 miles in twenty-three hours, while the actual running time was but nineteen hours and thirty minutes. The time of the special from Chicago to Chicago Junction, 273 miles, was six hours and thirty minutes, actual running time five hours and thirty-five minutes, and an average rate of forty-eight and nine-tenth miles per hour—an unprecedented run for the distance. At one time, fifty-seven miles were accomplished in fifty-nine minutes, and frequently single miles in from fifty-six to fifty-eight seconds.

The final twenty-seven miles, from Barnesville to the Ohio River, were made in twenty-eight minutes, and six miles of the distance were run in four minutes, or at the rate of ninety miles an hour. The 463 miles from Chicago to the Ohio were run in eleven hours and twenty minutes, including thirty-eight stops; actual running time, nine hours and twenty minutes. The last sixteen and three-quarter miles were run in fourteen minutes.

Taking into consideration the inferiority of roadbed construction of the Baltimore and Ohio as compared with the Pennsylvania Railroad, the latter could cover the distance between New York and Chicago in fifteen instead of seventeen hours.

Now, as to my calculations "in their wideness of the mark for slowing up at thirty-four grade crossings," the above run of 463 miles, making thirty-eight stops of 3⅛ minutes each, and averaging about fifty miles between stops, and the following, which is done every day on the Pennsylvania Railroad, is the best evidence that the above quotation is incorrect:

The Pennsylvania Railroad Company runs twenty-two trains a day from this city (Philadelphia) to Paoli, a distance of nineteen miles, and back, in fifty-five minutes, and makes sixteen stops to let off and on passengers and baggage. The time occupied for each stop averages but two and one-quarter minutes, and between stations the rate of speed averages sixty miles an hour. So, from this, it will be seen that my allowance "for slowing up at thirty-four grade crossings" of twenty minutes is sufficient, and that an engineer on this road "can handle his engine with extraordinary skill."

This company can and does "pick up" water at speeds of from twenty to fifty miles an hour, depending on the quantity needed. In point of fact, they quite often run from Altoona to Harrisburg, a distance of 131.6 miles, without using the "water scoop" at all.

The locomotive "Watt," of the London and North-western Railway, England, in 1862, ran the special train which conveyed the Queen's messenger bearing the despatches containing the decision of the American Government, in the case of the Trent difficulty, from Holyhead to Stafford, a distance of 131 miles, without a single stoppage. The journey was made in 144 minutes, being at the rate of fifty-four and a half miles per hour. This remarkable run was made without stopping, by the aid of Mr. Ramsbottom's "pick-up" apparatus for supplying the tender with water while running.

"The link motion, in his opinion, does not distribute the steam properly." The best evidence that the link motion reduces the power of the engine is found by examining the indicator diagram. The writer of the criticism must certainly know—if he does not, he should immediately inform himself on this subject—that it would not require a renewal of cylinders, as the steam ports of a properly-constructed locomotive cylinder are large enough, and it is the use of the present shifting link to vary the point of cut-off that constricts them when cutting off at 6 to 8 inches. The position of the valve, due to the operation of the link, and not the size of the

ports, causes the constriction or "throttling." The engineering world has nearly outlived a preference for throttling for regulation of speed, and so far recognized the economy and ability of variable expansion for such purposes that the writer has not, in the preparation of his paper, considered it debatable.

The statement that "Corliss motion has been repeatedly tried on American locomotives, and was the worst kind of a failure," is not true in fact. Mr. Corliss built two locomotives, which were defective in workmanship, not in results. If everything that failed on a single trial was condemned, we would to-day be footing it to Chicago, in place of going by rail; that is, if the Chicago of to-day would ever have been built under such circumstances.

It is not anywhere of record that locomotives with "Corliss" valves have been numerous. The writer personally knows of only one, and has heard of only two, that were definitely stated to have been made, with a like number of failures. James Watt should never have made a steam engine.

Every experienced locomotive engineer knows that the distribution of steam by the link motion is imperfect and unsatisfactory, and for fast-running locomotives there are substantial demands for an improved valve gear. Any engineer who will compare the indicator diagram, taken from an engine fitted with a link motion for regulating the point of cut-off, with those of an engine fitted with independent cut-off valves, will see at a glance the great loss of power due to the former. I do not propose to dispense with the link motion, but to add a variable cut-off valve in addition, as I consider the link motion the readiest and simplest means of reversing the engine; and, when cutting off short, the link may be worked to vary the exhaust. It is found to be less advantageous to hold on to the steam as long when cutting-off short as when following for a greater length of the stroke. Let an engine, constructed with both link motion and a separate cut-off valve, have the latter set at one-quarter stroke, the engine meanwhile running along at a corresponding speed. The link, which is supposed to be working the main valve at full throw, may now be pulled up, notch by notch, and it will be found that with each rise of the link, and consequent shortening of the throw of the main valve, whereby the exhaust is released earlier and earlier, the engine will quicken its speed.

In March 1850, Mr. Eathan Rogers, of the Cuyahoga Works, Cleveland, Ohio, completed a locomotive in which the cut-off valves were worked with an adjustable throw from curved rocker arms, the arrangement being known as the sword cut-off, and it was found to be very efficient, as were other engines having similar valve gear, but on account of its complication as it was thought, this construction was afterwards abandoned.

Were the locomotives of our fast trains to-day fitted with an independent cut-off arrangement, there would be no necessity for having water tanks between the tracks for "picking up" water while running distances under one hundred miles, and the high initial pressure that would be gained would show, as I claim, that the loss now suffered is due to the link motion.

Independently of a separate cut-off valve, the improvements made by the Pennsylvania Railroad Company, since the indicator diagrams were taken, by the substitution of the Allen valve, etc., will enable them if they so desire to make the time in *seventeen hours*. It is not a question of their *ability*, but simply whether or not it will *pay*.

WM. BARNET LEVAN.

Philadelphia, Pa.

### A Bad Boiler Construction.

*Editor American Machinist:*

The writer begs leave to call your attention to the prospectus of the Lawson Non-Explosive Boiler Company, written by Mr. Thos. Kays, and issued from the Company's offices, 155 Broadway, New York. The gist of the invention consists in placing a diaphragm just above the point where the water is to be carried, said diaphragm being perforated, its office being to prevent a too rapid discharge of the steam from the water into the steam space. On the printed matter in the circular the writer would make no comment whatever, except in regard to one point. This boiler is given out as a "non-explosive

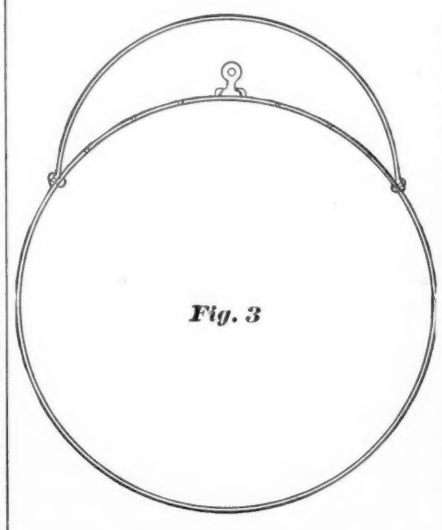


*Fig. 3*

boiler," and yet in Fig. 3, facing the preliminary remarks, is shown an old style boiler with an additional steam space furnished above the shell by riveting a new course on top of it, having a semi-circular form. The top of the old shell is perforated to allow the steam to pass into the space so formed. This makes that portion of the shell which is covered by the added steam space dead iron, leaving only its stiffness to prevent its being drawn into the circle, of larger diameter equal to the length of the sheet of metal added, and makes a positively dangerous arrangement.

It is probable that local inspection in the cities would prevent such a boiler from being run, but it is certainly the duty of engineers to show it up, and thus prevent parties who are not engineers from buying and running what is undoubtedly a very dangerous mechanical arrangement. NAT. W. PRATT.

New York.

### Making Oil Flow from the Cup.

*Editor American Machinist:*

I see by your issue of June 14 that a correspondent is troubled by his oil remaining in his oil cup all day. I was troubled the same way until I commenced blowing a little steam through the cup, just before I filled it, and I have had no trouble since.

J. W. QUINNOY.

North Attleboro, Mass.

### Probable Cause of Truck Boxes Cutting.

*Editor American Machinist:*

In answer to inquiry of Link, who wishes to know the cause of truck boxes cutting, I can easily answer. I do not know if all four of the boxes cut at one time; that is, if no changes had been made in truck or engine, and they were all worn. I suspect the truck was what is known as a swinging center. If it had that, the cutting can be easily accounted for. The center plate is all right. Perhaps when the truck was fitted up it was fitted too closely between hubs and boxes, and in the start it took a little space for itself and put all the hubs and boxes in good condition for wearing. Perhaps the hubs of the wheels were small, or perhaps they had liners fastened on with wrought-iron bolts. Perhaps this is all guesswork. If I could see that truck, I might guess a little nearer.

A. DOLBEER.

Renovo, Pa.

Beginning July 1, pig iron imported into Russia will pay a duty of 9 copecks per cwt., which is about $4.40 per ton of 2,240 lbs.

It is now proposed to use glass-rimmed carrier pulleys for the cable on cable roads, the claim being that the cable will be injured much less than where iron-rimmed wheels are used. It is also proposed to make the bearings of the pulleys of glass.

## General History of Stationary Steam Boilers.

BY WILLIAM LOWE.

FIRST PAPER.

What wonderful results have been obtained through the agency of the steam boiler! What astonishing effects produced by this kettle of boiling water! See the colossal mills and factories whose power is steam! The monster steamship floating in the element which, confined in the boiler, furnishes the power to propel it! The locomotive, whose body is its boiler and whose life is steam! Yet with all its grandeur of effect, the steam boiler is simple; still in all its simplicity, and after so many years' use I venture to say that very few steam users know what controls the economy of the fuel that produces steam, and gets the most useful effect for their requirements. It is the interest the writer has in giving all the information he can to steam users, that induces him to write this history of steam boilers in as plain and simple language and terms as possible, so that all may know what results may be expected from the several kinds and systems of boilers under all conditions.

The first system of boilers put into general use for stationary power were of the externally fired kind, and were inclosed in brickwork, with a fire-brick furnace at the front end, from which the heat passed under the boiler to back end and thence returned on the sides to front end, to chimney, as in the first Watt wagon-top boiler (so called because of the shape of a wagon top). Afterwards a flue was put through this boiler, through which the heat returned to front end, and thence on each side to rear and chimney. Then, of this class, came the plain cylinder boilers, which are simply cylindrical vessels of suitable diameter and length, which are set in brickwork, with a furnace at front end, from which the heat passes beneath the boiler to back end to chimney; also the cylindrical boiler, with one, two, or more flues through them, through which the heat returned to front end to chimney. In some, with two flues, the heat returned through one flue and back through the other to chimney, and in large boilers the returns were made through the lower flues and back through the upper ones to chimney. There are many modifications of this system. Later on came the return tubular boiler, which is of this class. This is a plain cylindrical shell with heads, and furnished with a number of tubes from two to four inches diameter, extending through the heads. This boiler is set in brickwork, and the heat from the furnaces passes beneath it and returns through the tubes to chimney. Some are set so that the heat returns over the top of boiler to chimney. Several combinations of this boiler, both plain cylindrical and large-flued boilers, have been introduced from time to time, all having external furnaces, from which the heat is conveyed over the heating surfaces of the combination. All the types known as safety boilers have more or less of this system of combination, in tubes, shells, and various forms of cast and wrought iron vessels, over, around, or through which the heat from an external furnace is made to pass. In all these the furnaces are of brick, and the heat is confined by the brick walls of the setting.

After the wagon-top, plain cylinder, and large-flued boilers, came the system of internally fired boilers, one type of which—the Cornish boiler—is cylindrical, with one large flue through it, in one end of which is the furnace, from which the heat passes through the flue to the rear and then splits, and returns on the sides, and back under the bottom to chimney. This boiler is set in brickwork. Another of this class, said to be an improvement on the Cornish, is the Lancashire boiler, which is of the same form, but has two flues with a furnace in each, the heat passing through the flues to rear, and returning the same as in the Cornish. There is another of this class, called the Galloway boiler, which is of same form as the others, and has two cylindrical furnaces, which connect to one large main flue, concentric on sides with shell of boiler, and top and bottom of flue concentric with each other. Across this flue, vertically, there are a number of conical tubes set, through which the water circulates from bottom to top. There are also projecting from the side of this flue, into it, pockets for obstructing and turning the current of the gases around and amongst the conical tubes, for the purpose of perfecting combustion. These projecting pockets are called bafflers, and probably produce some effect. The heat passes through this large flue to rear and then splits, and returns on the sides, and back under bottom to chimney. This boiler is said to be an improvement on both the Cornish and Lancashire boilers.

We now come to the American drop-flue boiler, which is said to be an improvement on all three of the last described, and I believe it to be one of the best boilers ever introduced. This also is cylindrical in form, with one or two furnaces (according to its size) in the end; the sides concentric with the shell. From the back end of furnace there are large flues that extend through the boiler and connect with an internal chamber at the back end, and from this chamber there are other flues (called drop flues, hence the name of boiler), which extend from this chamber and connect into another chamber in the bottom of the boiler, just back of the furnace, which chamber has an opening out through the bottom of the boiler. The course of the heat is from the boiler, through the upper flues, to rear chamber, and then through the lower, or drop flues, to the chamber in the bottom behind the furnace, thence out and beneath the bottom of boiler to chimney.

There is also the locomotive type of boiler, which has an internal furnace of square form generally, with water legs all round, and in some a water bottom projecting below the shell. The shell is cylindrical, and attached to the back of the furnace, and through which large flues or tubes of from 2″ to 4″ diameter extend, from the furnace through the backhead. These boilers are generally set in brickwork, but those with tubes are used both with and without brick-work. In those without brick setting, the heat from furnace simply passes through the tubes into a smoke-box and into smoke-stack or chimney. The object of setting this type of boiler in brickwork is to get the benefit of the shell heating surface, same as in other boilers of the internal furnace type, and the result is a larger boiler and better economy of fuel, as the heat returns underneath to furnace and to chimney. The vertical tubular boiler is also one of this class of internal furnace boilers, in which tubes are used from 2″ to 3″ diameter, extending from the crown sheet of furnace, through the upper head, or into a submerged chamber in the top. In these the heat from the furnace passes up through the tubes into either the submerged chamber or into a smoke-box on top, to which the smoke-pipe or stack is attached. There are several modifications of this class both with and without internal furnaces.

In some cases, marine types of boilers have been used for stationary purposes. These generally have square furnaces, from which large flues extend into a back chamber, and from this chamber tubes extend into an up-take chamber in the front end, or through the front end, into a smoke-box. The course of the heat is from furnace through the flues to chamber, and from chamber through tubes to the up-take, or smoke-box, and to chimney.

Having described about all the types of boilers put into general use, I may safely say that they are all still in use, or some modification of them, and all have their advocates amongst the makers and users, who think those they advocate are the best for any use. In this history I shall endeavor to show which type or system of boiler will produce the most result from the fuel and outlay in first cost, cost of maintenance, and wear the longest under equal conditions, and for the several conditions and kinds of fuel.

It is said that in many of the ports of England from 20 to 25 per centage of registered freight steamships are idle.

## Notes of Master Mechanics' Convention.

After the meeting was called to order on the second day, Mr. Setchel mentioned that Mr. Dripps, the oldest master mechanic in America, was present, and moved that he be called to take a seat beside the president. The old gentleman, who is still hale and of unimpaired intellectual faculties, received a hearty welcome from the members.

A somewhat lengthy discussion ensued on the committee's report on boilers. Items and recommendations of the report were taken up consecutively and discussed.

Mr. Barnett, of the Midland Railroad of Canada, said they had adopted screw crown sheet stays with reluctance, and they now had them in use several years with the most gratifying results. He had heard it mentioned that fire-box door openings, ringed by flanging the sheets, had given trouble from getting burned, and the cause was attributed to mud lodging on top. He had experienced similar trouble where he was certain there was no mud, and he attributed it to contracted space preventing free circulation of water.

Keeping all longitudinal riveted joints above the water line was recommended.

Mr. Forney thought this question had been settled long ago. The Board of Trade in England had been very emphatic in their condemnation for many years of joints placed below the water line.

Mr. Lander, of the Old Colony Railroad, put these joints above the water line from theory, and he was justified by practice. Thought it was well to draw the attention of younger men to the necessity for keeping these joints above the water line.

Use of butt welts and double riveted seams, instead of ordinary single or double riveted seams, recommended.

Mr. Lander considered a butt welt joint preferable to single or double riveted joints, because it prevented furrowing of the sheets.

Mr. Setchel thought that the butt joint was a more secure job than the common joints, and prevented the movement of the sheets which destroyed the other joints in time.

Use of mild steel for shell and fire-box was recommended.

Mr. Setchel said that other countries used copper for fire-boxes, thinking steel was not so good. He had obtained good results from iron, and thought that the necessity for steel depended on the water used.

Mr. Lander spoke of the unsuccessful attempts made to use steel for fire-boxes in Britain. He thought they had failed in their attempts in that direction through using the wrong quality of sheets. The steel they used was too high in carbon, and it cracked when put in service.

Mr. Sprague, of the Porter Locomotive Works, agreed that English makers had put steel too hard into fire-boxes. He got one of these fire-boxes to repair, and the steel was so hard that they could hardly cut it with a diamond chisel.

Mr. Forney had found, when in England, that locomotive superintendents were very anxious to obtain information as to how we made a success of steel fire-boxes. He was disposed to think that their failure with steel had to some extent been associated with the use of calcarious feed water. He mentioned that many English engineers would visit this country in the fall, attracted by the meeting of the British Association at Montreal, and he asked for them a cordial welcome from master mechanics.

Mr. Berry had found that when boilers were kept clean steel did very well, but when mud was permitted to accumulate upon the sheets they cracked. With ordinary men and limey water, he preferred iron for fire-boxes.

Mr. Johann, of the Wabash Railroad, thought their system of firing had something to do with the failure of steel fire-boxes in England. His own experience had been that where a heavy fire was carried the side sheets cracked. He had been compelled to forbid his engineer from running with heavy fires twelve or eighteen inches deep. About eight inches was deep enough. Since this reform was made he had no trouble from cracked sheets.

Mr. Sinclair, of the AMERICAN MACHINIST, thought that bad feed water was not responsible for the failure of steel fire-boxes in England. He had devoted much attention to the analysis of water for boilers, and he felt assured that roads in the West were employing steel fire-boxes successfully with worse water than was used on any railway in England. He thought that the trouble was in the selection of hard steel that was worked without being properly annealed. The experience of our own roads showed that it took some time to get into the way of working steel sheets properly.

Mr. Twombly, of the Chicago, Rock Island and Pacific Railway, testified that they used steel successfully, and their water was badly impregnated with lime.

Mr. Lander recommended that the practice be adopted of making the mud rings deep enough to get in two rows of rivets. He has adopted this plan, and finds it effects great saving in preventing leakage. A ring about four inches deep is his preference.

Mr. Hovey, of the R. and P. Railroad, favored a deep double riveted mud ring.

Mr. Setchel did not wish the members to think he favored iron in preference to steel. If the water was good, he would guarantee good iron for any length of time; but long experience had convinced him that the kind of water was a very important factor in the wear of fire-boxes.

Mr. Sprague said that steel was now as cheap as good iron.

Mr. Hovey, to illustrate the effect that bad water and coal had on sheets, mentioned the case of a sheet that gave out shortly after being put in. He cut part of the sheet out, and finding it was very brittle, sent it to the makers. They annealed it and returned the piece, and then he found it soft and ductile.

Mr. Porter, of the Indiana, Bloomington and Western, mentioned an experiment he made to test the relative value of good iron and steel for fire-boxes. He put a steel sheet on one side and an iron sheet on the other side of the same box, and put the engine into ordinary service. He found that the steel sheet wore better and gave less trouble than the iron sheet.

Mr. Johann does not anneal steel sheets before working them, and he punches the holes, although most authorities recommend drilling. But he rigidly prohibits drifting. With this system he finds the results are satisfactory, although the water is so bad on some divisions that the flues have to be taken out every six months for cleaning.

Mr. Britton said that the great enemy of heating surfaces is lime, and the right plan was to work in the direction of pure water. The question was then asked, what are Western railroad managers doing to secure surface water?

The answer given by several members was that they are still agitating the subject, and some progress was being made in what all agreed in regarding as the right direction.

Mr. Fuller, N. Y., L. E. and W., found well water very objectionable, since in his district it was badly loaded with lime. The coal he used was mixed with sulphur, and he found this made the fire-box sheets brittle.

A short discussion arose on boiler-purifying compounds, and one member mentioned that he had used a chemical compound in his stationary boiler with advantage. The general opinion was that chemical compounds could not be used successfully for locomotive boilers.

### RECOMMENDATIONS OF COMMITTEE ON BOILERS.

A wide water space surrounding the fire-box—not less than 3 inches—increasing upwards, if possible.

Clearance space between flues not to be less than $\frac{3}{4}$ inch.

The exclusive use of lap-welded iron flues, instead of brass or composition flues.

Disuse of solid ring around fire-door opening.

As few holes as possible in the boiler shell for cocks, valve attachments, etc., and as many as necessary for washing-out purposes.

Dome openings to be reinforced by strengthening plates or double flanges.

Rocking grates for bituminous coal.

Leaving boilers free to move on frames, and the abandoning of back braces.

Not attempting to get rid of mud by mud drums, but by blowing off under a good head of steam.

An increase of pressure on boilers must be adopted.

Mr. Sprague thought the proper distance between flues depended on the nature of the water used.

Mr. Eastman, S. E. Railroad, uses iron flues, and wished to hear the experience of members who had used other kinds. For several years he has used galvanized iron strips, instead of copper strips, to go in between the flue and the sheet in setting flues. When this strip was used, the flue end was not swedged.

Mr. Johann uses copper ferrules at both ends, and he does not swedge the flue. He allows $\frac{3}{4}$ inch between flues.

Mr. Forney regretted that the subject of strengthening dome openings had not received more attention from the members. He had been talking to Mr. Hain, of the Elevated Railroads of New York, some time ago, and learned that they had experienced great trouble with the seams round the base of their domes leaking. He attributed that to weakness.

Mr. Wilder's plan had been to flange up the boiler sheet for strengthening the dome base, and he had experienced no trouble when that plan was followed. He used sling stays to strengthen the dome.

Mr. Sinclair knew about the trouble with domes on the Elevated Railroad. The officers in charge of the machinery, finding they had trouble with the base seam of their domes leaking, determined to find out the cause before devising a remedy. They devised a plan for taking exact measurements of the dome and boiler, and took the measurements with great care when the boiler was cold, then repeated them when steam was raised. From this they found that when steam tension got on the boiler it widened itself out below the dome, tending to become oval instead of circular. They strengthened the dome base by putting in a strong ring, and there was no more trouble. Putting in sling stays would be useless in a case of this kind.

Mr. Johann followed the practice of stiffening his dome base with a ring.

Mr. Austin, of the Baldwin Locomotive Works, said that the engines on the Elevated Railroads had been made when a demand for extreme lightness prevailed. Owing to this, the boiler sheets were too light, which was really the cause of trouble with their domes. The boiler sheets in these domes were flanged upwards.

Mr. Setchel wished to make a protest against abandoning back boiler braces. These braces were of no use when the engine was at work, but they did good service when jacking-up had to be done. He had not yet seen the engine with frames strong enough to dispense with back braces at that time.

Mr. Johann approved of the recommendation to abandon drums. He thought they were a useless appendage.

Mr. Setchel did not wish to see boilers blown off while hot. He thought a boiler should be gradually cooled down before being washed out.

Mr. Wilder said, when an engine came into any of his shops that had to be washed out quickly, their practice was to blow off the steam till a hose pressure would force water into the boiler. They then filled the boiler, opened the blow-off cock, and let the cold water mix with that which was hot till the whole boiler was cooled down.

Mr. Lander has become thoroughly convinced that the proper way to obtain increased economy is to increase the pressure of steam on the boiler. He has already got it up to 175 pounds per square inch. There is such a demand for heavier engines to obtain the necessary adhesion that engines are being made heavy with blocks. He wished to see the weight put in the boilers. They could use $\frac{1}{2}$ inch steel plates for boilers, and that would give the required weight, besides enabling them to carry much higher steam pressure.

## Boiler Defects.

In the report of the chief engineer of the National Boiler Insurance Company of England, the following percentage of different boilers is given from a list of about 10,000, and is presumably about the proportion in which the different kinds are used in the United Kingdom: Lancashire, 35 per cent.; Cornish, 26 per cent.; plain cylindrical, 12 per cent.; Galloway, 3.75 per cent.; locomotive, 4.5 per cent.: multitubular and multiflued, 2.25 per cent.; cylindrical and "breeches flued," 1.1 per cent.; vertical, 8 per cent.· and others of various construction.

Internally fired boilers, 82 per cent.; externally fired, 18 per cent.

The number of explosions from July, 1864, to December, 1883, is given as 945, of which 141 were from external corrosion; 47 from internal corrosion: 44, general deterioration; 27, internal grooving; 7, defective staying; 101, weakness of tubes; 50, insufficient staying; 22, weakness of manhole; 17, defective material and workmanship; 11, general construction (water tube); 9, weakness of end plates; and 3, lack of safety valves.

Over-pressure is credited with 104 explosions; deficiency of water, 123; overheating through deposit, 21; overheating through defective flues, 2; fracture at riveted seams from external firing, 71; causes not ascertained, 145.

One instance is noted during the year in which two Lancashire boilers were found so dangerously weakened in the sheets in contact with the brick walls that nearly all these plates required renewals.

In another instance a Cornish boiler, supplied with water from a well, was virtually destroyed by pitting in eighteen months.

In some boilers of the locomotive type the stays were found reduced to half their original strength from corrosion.

The practice of emptying boilers under pressure is condemned.

In the instance of small vertical boilers with internal fire-boxes, the inspectors have found several chimney tubes distorted, and it is recommended that these tubes be constructed so as to receive a fireclay lining, and, where boilers are in use without provision for such lining, it is advised that a cast-iron liner be used in the tube.

## Forging by Pressure.

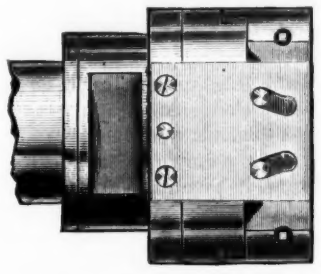
The United States Gun Foundry Board that visited Europe some time ago to investigate ordnance making, were very much struck with the methods of forging by pressure followed in the Whitworth works, Manchester. The press under which this system of forging is carried on is hydraulic, with a moving head having the main hydraulic cylinder fixed in it. The press is provided with an arrangement of mechanism for raising and lowering the moving head of the press and for locking the same in any desired position. The press has four hollow pillars screwed part of their length, which are attached to the base of the press by nuts. On the top of the pillars is fixed a cast-iron head or table supporting two hydraulic lifting cylinders, the rams of which are fitted with cross-heads carrying four suspension bars. These bars pass through the moving head, and are connected at the lower ends by cross bars, which are fastened to the pressing ram. The moving head works between the base and the top or fixed head of the press, and is raised or lowered by the admission or exit of water from the underside of the rams of the lifting cylinders. The moving head can be firmly and rapidly locked at any height from the base which may suit the work to be operated upon. The moving head, as already mentioned, carries a forging or compressing cylinder, which forces a ram down upon the work. By attaching the compressing cylinder to, and making it part of, the moving head, a short stroke can be employed when forging objects which may vary in size from a few inches to several feet in diameter.

This in general terms explains the working of the ram. The effect produced by it requires to be seen in order to be thoroughly

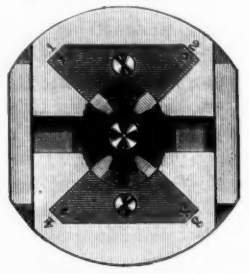
appreciated, and is altogether different from that produced by the hammer. The heated ingot resists the blow of the hammer, but the insinuating, persevering effort of the press cannot be denied. The longer time (several seconds) during which the effort lasts is a great element in its successful effect. As pressure succeeds pressure the stability of the particles is thoroughly disturbed and a veritable *flow* of metal induced, which arranges itself in such shape as the pressure indicates; the particles are forced into closer contact and the whole mass writhes under the constraint which it is impotent to resist.

## New Bolt and Nut-Threader.

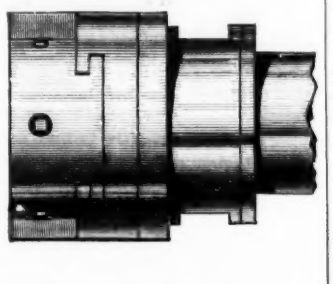
We present with this an engraving of this machine; also detached views of the head. As will be seen from these, the head proper is in two pieces, divided through the center. These two pieces are opened or closed by the operation of two double cam plates, which are attached to the back plate, and extend forward over the divided sides of the head. The cams work on hardened steel pinions, set in each half of the head. By this cam action the head is opened as the head plate moves forward, and closed as it moves backward, the forward and backward motions being accomplished by an automatic arrangement that closes the head at the proper time, and opens it after any length of thread to which it may be adjusted has been cut.



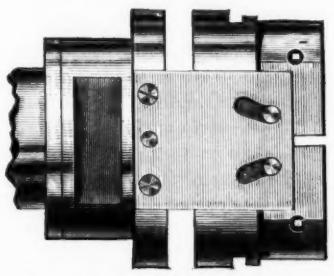
SIDE VIEW—HEAD OPEN.



FACE VIEW—HEAD OPEN.



TOP VIEW—HEAD OPEN.



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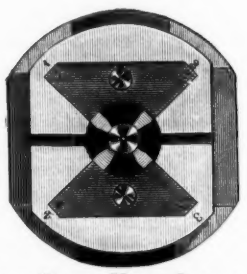

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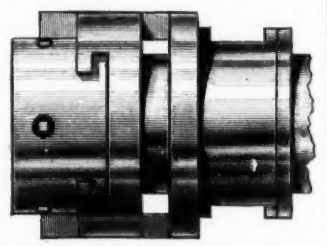

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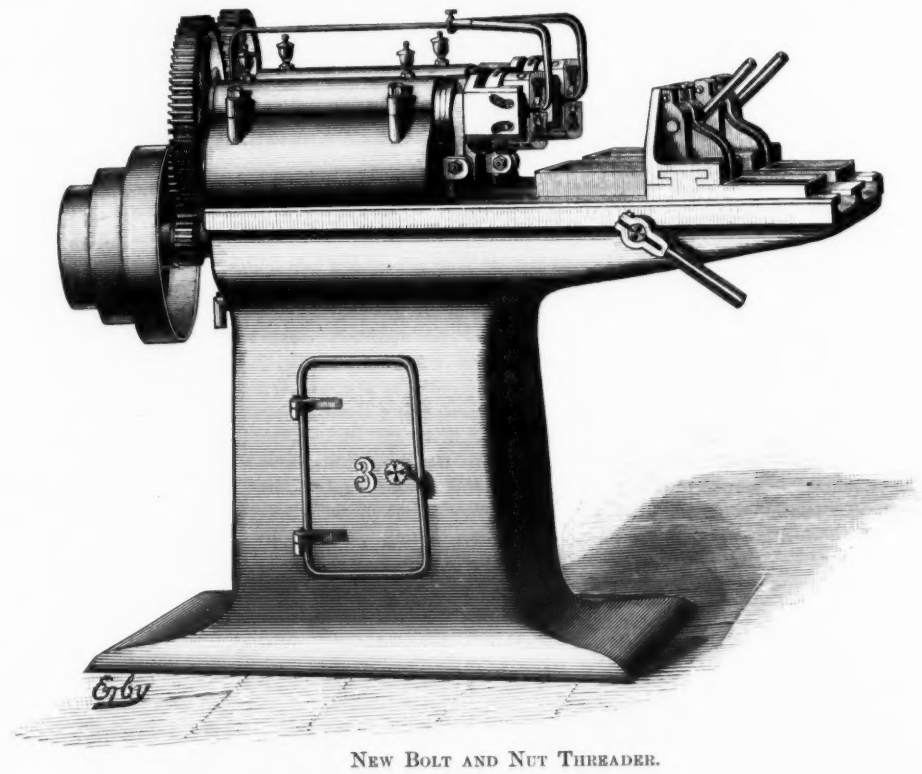

NEW BOLT AND NUT THREADER.

The automatic arrangement referred to consists of a graduated rod, the forward end of which is attached to an arm projecting underneath the vise carriage, and extending back towards the rear of the machine. This rod, which moves with the vise carriage, is furnished with two rings that are adjustable for regulating the length of thread. A forked lever is fulcrumed below the main shaft or mandrel, and acts by a cam movement upon a ring coupling on the mandrel, behind the back plate. This lever is attached, at its lower end, to a trigger. The backward movement of the vise draws forward the graduated rod, and the ring engages the trigger, lifting it to its place and closing the head, which is held closed by the lock action of the cam slots. As the vise moves forward, the forward ring engages the front end of the trigger, releasing and throwing open the head when the required length has been cut.

Four dies are used, which are set directly in the head, where they remain immovable, being held by two solid steel blocks, each of which is secured by a single screw. The end of each die rest against a screw, so that if they should wear unequally they may be separately adjusted.

The heads are made of machine steel, and all parts of the machines are made interchangeable.

An automatic pump throws a constant stream of oil into the head, washing out the chips and dirt, which fall into a perforated pan, forming a part of the front of the vise carriage.

These machines are manufactured in a variety of sizes by J. W. Adams & Co., 35 to 41 Indiana Street, Chicago, Ill.

David Renshaw, of Braintree, Mass., has recently received three patents on arrangements for utilizing the exhaust steam from a steam engine by returning it to the boiler. The principle involved is the taking of water from the boiler and returning it either by means of a pump or injector, in the return taking the exhaust steam with it, something after the manner of an injector taking water.

## More Experience with Fink's Patent Lubricator Humbug.

Once more we call the attention of our readers to the patent lubricating mixture of water, oil, potash, lime and chalk, with which Henry Fink & Son have, by deceiving a large number of careful and experienced business establishments, obtained anywhere from $50 to $300 from each for "shop rights." In our issues of March 22d, April 12th and May 10th, this year, we presented letters from quite a number of prominent establishments that, upon the strength of letters and contracts shown them by Fink, had paid money for this humbug, which claimed to save a large part of the ordinary expense for oil. The Pratt & Whitney Company, one of the establishments deceived, first called our attention to the humbug, and our correspondence and publication of the letters received by us from such establishments as the Cambria Iron Company, the Brown & Sharpe Manufacturing Company, Detroit Machine Screw Works, Providence Machine Works, E. M. Birdsall & Co., Plumb, Burdict & Barnard, Bulkley, Dunton & Co., New Orleans Gas-Light Company, Dueber Watch-Case Manufacturing Company, Carnegie Bros. & Co., Ashland Coal and Iron Railway Company, the Georgia Railroad, Natchez Cotton Mills Company, Coxe Bros. & Co., and many others who have been badly deceived by the Finks, have warned the public against the operations of these worthies. This week we present more letters of the same tenor as those previously published.

OFFICE OF LEEDS FOUNDRY,
NEW ORLEANS, LA.

*Editor American Machinist:*

Yours of 1st inst. making enquiry in regard to any transactions I may have had with Fink about his lubricator was duly received. It is with some reluctance I give my experience with the above named gentleman and his so-called lubricator, as no man willingly admits that he has been deceived and duped in a business transaction, when perhaps ordinary sagacity would have afforded him protection; but appreciating your course in relation to this man and his compound I am constrained, by a sense of duty, to give the information you require.

More than two years ago Mr. Fink called at the office of Leeds & Co. in this city, and exhibited to the purchasing agent, Mr. Greenleaf, a specimen of a lubricator, which he with much plausibility of speech, recommended as equal to the best oils, and greatly cheaper; at the same time submitting a large number of certificates, sustaining his allegations from respectable parties, well known to the proprietors of the foundry, and offering to sell the knowledge of the mode of compounding his lubricator, with the right to use it.

On this showing Mr. Greenleaf submitted the matter to me as the executive foreman of the establishment. I and Mr. Greenleaf both suggested that before closing with Mr. Fink, sufficient time should be given us for a fair trial of the compound; to this Mr. Fink replied that he had pressing engagements elsewhere, which if not met by him at the time appointed would result in a heavy pecuniary loss, and again dwelt upon the character of the certificates produced. On this Mr. Greenleaf closed with him, agreeing to give him $175 for the right to use the compound. Mr. Fink then mixed about 20 gallons of the stuff, using good lard oil as the basis, about one-half or more being water. He then left us, and we have never seen him since. We afterwards mixed up about the same quantity, using oil of an inferior quality as per instructions of Mr. Fink; after using the composition, nothing but the *water* remained, apparently holding none of the other ingredients in solution, or suspension, nor did the materials from the beginning mix together or amalgamate, except when stirred or agitated. Thus, it appears, that by plausibility of speech, aided by certificates, no doubt hastily given by the writers on insufficient data, we were deceived into purchasing the right to use a useless compound, of not as much value, as a lubricator, as the oil which forms its basis.

H. RENNYSON.

SALMON FALLS MANUFACTURING CO.,
SALMON FALLS, N. H.

*Editor American Machinist:*

One day's trial of Fink's mixture satisfied me. We tried it all through the mill and did not find one place that it would fill the bill as a lubricant. O. S. BROWN, AGT.

BOSTON STEAM AND GAS PIPE WORKS,
3 & 4 HAYMARKET SQUARE, BOSTON, MASS.

*Editor American Machinist:*

We purchased a right and formula for Fink's patent mixture. It answers the purpose for which we purchased it, and we use it in warm weather as it will not flow in the cold season. BRAMAN DOW & CO.

JACKSON COTTON PRESS.
NEW ORLEANS, LA.

*Editor American Machinist:*

We purchased from Henry Fink his process for treating lubricating oils, and, after experimenting with it for a short time, found it altogether unsuited to our wants. The amount we paid for the recipe we considered so much lost.

We still have the formula, of which we could give you a copy if necessary.

O'BRIEN & CO.
(In liquidation).

OFFICE OF MONUMENT MILLS,
HOUSATONIC, MASS.

*Editor American Machinist:*

We were called upon a few years since by a man calling himself "Fink," who offered us a receipt for making lubricating oil for cotton machinery. He came here with first-class recommendations from manufacturers with whom we were well acquainted, and without consideration we purchased his receipt, and, after making several attempts to use it, gave it up in disgust.

JOHN M. SEELEY, Agent.

OFFICE OF THE MORSE TWIST DRILL AND MACHINE CO.,
NEW BEDFORD, MASS.

*Editor American Machinist:*

Our experience with Mr. Fink and his mixture was very similar to that of other parties to whom he applied, and who became interested in his compound. His mixture, carefully prepared, had no value with us, and we early became satisfied that Fink was a reckless fellow, and his course for a living far from commendable. We paid him but a portion of the sum he required for the receipt for his compound; the balance he was to call for. He has not done so.

EDWARD S. TABER, Treas.

OFFICE OF L. M. FAULKNER & SONS,
LAWRENCE, MASS.

*Editor American Machinist:*

I remember Fink presenting a mixture for lubrication for wool oil to me for sale while I was agent of Faulkner Manufacturing Co. two years ago. He showed me letters from a great many parties using mixture, and speaking highly of same; also, one letter in particular from Ed. Holden, agent of Sterling Mills (eight sets), Lowell, speaking in highest terms of it. I had a telephone in my office, and I immediately called up Sterling Mills or Ed. (I know him well). I noticed the fellow commenced to get uneasy. I asked Holden if he used it and liked it. He said the fellow had been to him, and he thought him a humbug; he would not bother with it. I told him the fellow showed me a letter, written and signed by Ed. Holden, saying it was first-class. He said he was a fraud, and he had never written any such. The Lowell police notified me at the time, either before or after—have almost forgotten—that he was a fraud, and to look out for him.

R. FAULKNER.

A German suggestion to prevent breaking of water glasses is, to use two glasses, the space between them being filled with air, thus protecting the inner tube against the cold external atmosphere.

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NEW YORK, JULY 12, 1884.

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## Meeting of Master Mechanics' Association.

The seventeenth annual convention of the American Railway Master Mechanics' Association was, by general consent, declared one of the most successful and profitable meetings held by the association. The list of subjects brought up for investigation was second in interest to none that had ever been submitted, and the members exhibited a commendable disposition to enter fully into the work needed for research, while unusual readiness was exhibited to express opinions on matters brought up for discussion. This does not, however, mean that nothing is left to be desired among the members in their readiness to contribute their share towards the fund of knowledge on railway mechanical subjects being published by the association. The committees investigating several subjects had good reason to complain of the limited number of replies received to circulars sent out requesting information. It is easily understood how master mechanics decline to express decided views on some matters, but it is hard to conceive why there should be hesitancy about giving free opinions on such a subject as "Shop Tools and Machinery." Yet the committee having this subject on hand found great difficulty in obtaining any expression of opinion or details of experience from the members. This was much to be regretted, for many members have methods of doing work and special tools for shop operations that are not known to the members generally, and particulars about them would be of interest to nearly all master mechanics. In no case does the aphorism, "there is wisdom in a multitude of counselors," apply more directly than to an association of this kind. The members are associated together for the purpose of profiting in extended knowledge by the interchange of experience, and therefore no member should consider what he is doing unworthy to be published for the benefit of his fellow members. There is no want of interest among the members as to what their compeers are doing, as was testified in numerous cases where master mechanics expressed themselves to the representative of the AMERICAN MACHINIST as very much interested in the railroad machine shop items published from time to time in the paper. If the members would report, for the benefit of each other, notes of their individual work, it would greatly enhance the value and interest of the reports.

An interesting and profitable feature of last meeting was the numerous short discussions raised by brief questions. An hour is set apart each day, so that members will put questions before the meeting that the subjects may be discussed, and the plan has brought out valuable facts and information. There are many minor matters connected with railroad mechanical affairs that remain unsettled, one set of men preferring plans, articles, and methods that another set condemns. Discussions that tend to bring out explanations of this diversity of opinion cannot fail to be of value.

The Master Mechanics' Association have done themselves credit by electing to their highest place of honor Mr. John H. Flynn. Mr. Flynn is one of the oldest members, and during the many years he has been connected with the association he has been known as one of the most industrious workers and zealous investigators in railroad mechanical matters. If zeal and industry are worthy of recognition, it was right and proper to elect Mr. Flynn president.

Leading daily papers are howling over the passage of a pension bill through Congress to "admit claims hitherto barred." It is asserted that great sums of money will be required to pay these newly-admitted claims. If we could judge popular sentiment by the utterances of the principal daily papers, we should be constrained to believe that the people at large are strongly opposed to granting anything more to the disabled soldiers of the War for the Union than the Government has already bound itself to concede.

We do not believe the people of this country are actuated by any such sentiment, but that they are in favor of the disabled veterans receiving whatever can justly be granted to them. When the question of making free grants of immense tracts of the people's lands to private corporations was before Congress, these same daily papers were fervent in advising the national legislature to give away large slices of the public domain. They even urged it as a duty the Government owed these wealthy railroad corporations (who were spending money freely to corrupt members of Congress) to donate to them immense tracts of public land. The result was the corporations got the lands—equal in area to several times the State of New York. The value of these lands would pay full pensions henceforth to every disabled survivor of the war, and the people condemn the acts of Congress giving the lands away. The daily press is not a good guide to popular sentiment.

## Reconstruct Our Navy Yards and Arsenals.

Because the Brazilians have added to their navy a fine British-built iron-clad man-of-war, the New York *Times* thinks it would be right and proper for this country to abandon building the ships for its own navy and buy them from Britain. This recommendation is merely a part of the rampant free-trade policy of that paper, which would be satisfied to close up every ship-building yard and manufacturing establishment in the country when cheaper articles could be purchased in Europe.

It may be conceded that our navy-yards or contractors cannot build ships so well or so cheaply as they may be produced in England, for the reason that they have not had extensive experience on the work; but is that a good reason why we should destroy them and throw ourselves upon the tender mercies of a foreign market? The enlightened policy followed by all civilized nations has been, to become self-supporting in the matter of all articles of war. France and Germany do not now depend on England for building their men-of-war or ordnance, and the governments of these countries have been wise in their generation although the cost of building up their native industries has been great. In the last twenty years there has been an entire revolution in building man-of-of-war ships and in constructing heavy ordnance. Most advanced nations have recognized the fact that steel cannot be made into ships or cannon with the same appliances that were used in fabricating wood and iron, and they have changed their tools and their methods. The trouble with the politicians who rule this country is, that they want not only obsolete articles modernized without going through the scrap heap, but they wish the metamorphosis to be made with the ancient tools that are utterly unfitted for modern mechanical processes. Their policy seems to be modeled after the oft quoted action of the authorities of a court who met and passed three resolutions. The first was that a new jail be built, the second that the new jail be built out of the material in the old jail, and the third that the old jail stand until the new jail should be completed.

The way to build up a navy is to provide modern appliances for building the ships, and that entails a complete reconstruction of our navy yards that the politicians will not grant money to carry out. The cast-iron guns that our arsenals have turned out lately would be worthless against modern steel ordnance, but Congress shows no disposition to grant the means to erect efficient plant in our gun foundries. Yet that is the true line of reform that the constructive departments belonging to our government ought to follow. It is all right for Brazil, or Peru or any other semi-enlightened State that has no native manufactures or skilled workmen, to purchase its munitions of war from abroad; but the American nation will never permit its government to follow any such dependent policy.

We publish this week the third paper in the series of Early Engineering Reminiscences. The author, George Escol Sellers, who has consented to have his name appear with these papers, mentions events that occurred sixty-six years ago as being remembered by him as vividly as though they were the happenings of yesterday. He refers this week to the difficulties early engineers found in not being able to peruse the recorded experiences of other engineers whose work had preceded theirs. That difficulty is but small in these modern times, when mechanical and engineering literature is not only readily found, but is much less expensive than it formerly was.

## Professor Dudley's Experiments.

Professor Dudley has recently made a series of experimental trips over the Boston & Albany Railroad with his dynagraph car, which were undertaken for the purpose of demonstrating the difference in resistance between cars with 33-inch wheels, and those with 42-inch wheels. The increased resistance due to the smaller wheel is not so great as has usually been supposed. The dynagraph car records showed it to vary from 1 per cent. to 5 per cent., the difference being due to track conditions. The journal friction is nearly constant and is a ltttle higher in the case of the smaller wheel; then the large wheel gains some advantage where the track is in bad order.

Professor Dudley is engaged on very interesting and important photo-micrograph experiments to ascertain facts regarding the condition of various kinds of wood used for railroad building and equipment. He cuts a section from a piece of wood and magnifies it one hundred times, then photographs the magnified field. This makes a permanent record of the appearance of the wood, and the cellular arrangement and method of growth are shown clearly. He has subjected woods of all kinds to this graphic way of showing their structure. Wood that has given remarkably good enduring qualities under trying conditions, has been photographed, and also all the grades downward to that exhibiting the strongest tendency to premature decay. The object sought in this work is, data for determining with some degree of certainty the condition of wood before putting it into structures where its premature failure entails expensive renewals.

The pictures which this photo-micrograph process produces are beautiful works of art.

George Marshall, of Syracuse, N. Y., well known to the readers of the AMERICAN MACHINIST, through his articles on boiler-making, writes us that he is engaged two evenings in the week instructing a class in developing (laying out) boiler work. Mr. Marshall thoroughly understands this important branch of the business, which is something that the average boiler-maker, however expert in the use of tools, is seldom familiar with; in fact, strangely enough, it is not considered a part of the trade of boiler-making, yet a man cannot expect to rise above the position of journeyman without a knowledge of it. If such classes were more common, the position of the boiler-maker among mechanics would be correspondingly improved, and the good results would affect not only boiler-makers, but boiler users. Those who improve the advantages of attending classes of this kind will never be likely to regret it in after years.

A remark made by Mr. J. H. Setchell during a debate in the Master Mechanics' Convention caused considerable amusement. He was speaking on his method of making locomotive engineers. His practice is to raise his own man, and cogent reasons were given for so doing. Speaking of the practice of hiring engineers, he said: "A man comes along looking for a job, and I ask him 'Why did you leave the road you were on?' 'Well,' he says, 'I don't think the old man treated me just right and I quit.' 'Well,' said Setchell, pointing to himself, 'I conclude this old man will not treat him just right either, and he will leave me when his services are most needed, so I prefer to set up my own engineers, since I know the men I am putting into responsible positions."

The Master Mechanics' Association closed June 19. At a meeting held on a special train, between Long Branch and New York, John H. Flynn presiding, the following resolutions were proposed and carried by acclamation:

*Resolved*, That the thanks of the American Railway Master Mechanics' Association are due, and are hereby most heartily tendered to Mr. Charles T. Parry, for his kind invitation for the members and their friends to visit Beach Haven, and for his splendid hospitality and generous entertainment of them while there; to Mr. J. E. Wootten, general manager of the Philadelphia and Reading Railroad; to Mr. Blodgett, superintendent of the New Jersey Southern Railroad; to Mr. J. J. Faro, superintendent Tuckerton Railroad; to Mr. W. W. Stearns, superintendent New Jersey Central Division, for courtesies in permitting them to travel by special train; to Mr. W. Woodcock, for his indefatigable labors to promote the comfort of those attending the meeting; to Mr. Mann, of the Boudoir Car Company, and to Mr. Talbott, for kindness in placing their private cars at the disposal of members.

ANGUS SINCLAIR,
Secretary *pro tem.*

## Literary Notes.

John Wiley & Sons, 15 Astor Place, New York City, make the following announcement, which explains itself:

"LOCOMOTIVE ENGINE RUNNING AND MANAGEMENT; by Angus Sinclair, M. E.:

"A practical treatise on the locomotive engine, with particulars showing how different kinds of trains are taken over the road with dispatch and economy. Illustrated by numerous engravings.

"This book is the outgrowth of articles contributed by the author to the AMERICAN MACHINIST, and other technical journals. The matter has been nearly all prepared from notes taken during the writer's experience as a locomotive engineer, and as Round-House Foreman at the mechanical headquarters of one of our leading railroads.

"The work consists of chapters on Engineers and their Duties; Inspection of Locomotives; Running a fast Passenger Train; Running a Fast Freight Train; Hard Steaming Engines; Injectors; Accidents to the Valve Motion; Accidents to Cylinders and Steam Connections; The Valve Motion; Laying Out Link Motion; The Indicator; The Westinghouse Air Brake; The Eames Vacuum Brake; Traction and Speed; and numerous other subjects interesting to those engaged in designing, handling or repairing the locomotive. The work will form a reliable hand-book for locomotive engineers and firemen.

"The above work is now in press and will be issued this Fall. It will be a neat 12 mo, similar to *Extracts from Chordal's Letters*, and the price will be $2."

The New York *Newsdealer and Stationer* is a new monthly paper, published by the Newsdealers and Stationers' Protective Association, of New York and vicinity. The first number looks well and has a good advertising patronage. It looks as if the paper had come to stay. Subscription price is 50 cents a year, or 4 cents a copy.

## Questions and Answers.

*Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.*

*Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.*

(267) W. H., Morgantown, W. Va., asks: What is the horse-power of our engine, 3″x6″, running 150 revolutions per minute with 60 lbs. boiler pressure? *A.*—About one-horse power.

(268) M. L. S., Walden, N. J., asks: 1. Will a one-horse power engine run a light wagon? *A.*—Yes; but the power would be too small. 2. How would you connect such an engine to the wagon. *A.*—The devising of a satisfactory means of making such connection would require more consideration than we can give the subject; besides, it would depend entirely upon what kind of an engine was to be connected.

(269) T. B., Springfield, O., asks: 1. Will you give me the address of the builders of the Wheelock engine? *A.*—Wheelock Steam Engine Company, Worcester, Mass. 2. Should not an engine 12″x24″, running 100 revolutions per minute with 60 lbs. steam, develop 55-horse power cutting-off at one-half stroke? *A.*—Such an engine, if of good construction, would probably work up to 55-horse power, but should not be depended upon to do so at that speed and boiler pressure. 3. In a tubular boiler, with dome 24″x26″, the distance from top of tubes to shell is 13″. Is not the steam likely to be wet? *A.*—Judging diameter of shell by the size of dome, we should say that with water carried at the usual height over tubes, the steam would be likely to be wet.

(270) A. L., Lynn, Mass., asks: 1. What is meant by clearance in an engine cylinder? *A.*—It is space between the piston and the cylinder head at the end of the stroke, added to the space between the bore of the cylinder and the face of the valve. 2. When speaking of 1 lb. of coal evaporating 8¼ lbs. of water, does it mean heating the water to 212°? *A.*—No; it means converting the water into steam. 3. What is meant by the duty of a pumping engine? *A.*—See answer to question 138, March 29, 1884. 4. In your issue of May 19, 1883, you say, in answer to the question "Can as much water be evaporated from the temperature of the feed, at 100 lbs. pressure as at 50 lbs. pressure?" No. This seems to be a question of boiler pressure, and not of the heat of feed water. Can you make it clearer to me? *A.*—The question relates to evaporating water of a given temperature, in one instance into steam of 50 lbs. and in the other into steam of 100 lbs. pressure, and the answer expressed the fact that it required more heat under the circumstances to evaporate, say a pound of water, under a pressure of 100 lbs. than it did under a pressure of 50 lbs. 5. We have a 5″ wooden pump drawing water through a 2″ pipe 100 feet long. The pump works hard. If the pump were 3″ or 4″ would it not work easier? *A.*—The pump would work easier and pump less water.

(271) Engineer, Albany, N. Y., asks: 1. What is gained by the use of a cut-off on the low-pressure cylinder of a compound engine? *A.*—The cut-off on the low-pressure cylinder brings about better economy in the use of steam. Some of the reasons for this are that it provides less variation in the temperature of the high-pressure cylinder, and less fall of pressure between the cylinders. That the cut-off results in better economy is a fact that has been settled by experiment rather than by theoretical considerations. 2. I suppose a cut-off is for the purpose of saving steam. Where is this steam that is cut-off in the low-pressure cylinder stored until the next stroke, and why does it not result in excessive pressure against the high-pressure piston? *A.*—In compound engines, where steam is cut-off in the low-pressure cylinder, there is a receiver between the two cylinders. Not necessarily a separate vessel, but may be made up of the space in the pipe and steam chest of the low-pressure cylinder, and the steam from the high-pressure cylinder is exhausted into this receiver, or space, without very materially increasing the pressure after cut-off in low-pressure cylinder. The pressure between the cylinders is higher for the cut-off on low-pressure cylinder, but this amounts to doing more work in the low-pressure and less in the high-pressure cylinder.

(272) W. D., Perth, Ont., writes: I have charge of a steam fire engine the boiler of which is 28″ inside diameter. The fire-box is 28″ diameter, 18″ high, fire-door 8″x13″. There are 252 tubes one inch diameter and 16″ long, then 22″ space above tubes. 1. How many square feet heating surface is in the boiler? *A.*—As near as we can calculate, from your description, there would be a little more than 100 feet heating surface. 2. How many feet heating surface to a horse power? *A.*—It is customary to allow 12 for vertical boilers with natural draft. 3. The steam cylinder is 9″x9″, water cylinder 5¼″x9″; are they well proportioned to force water through 2,000 feet of 3″ hose, and throw 100 feet with 100 lbs. boiler pressure? *A.*—They are about the common proportion of steam fire engine cylinders; the water cylinder is perhaps a little smaller than usual. 4 We do not have a fire here oftener than once in three or four months, and the wood gets damp and will not burn well. Can I remedy this? *A.*—We do not see any way. 5. I keep thirty gallons of water in my boiler. What is the average time required to get up 80 lbs. steam from cold water, and throw water 100 feet through 1,500 feet of hose, no blower being used? *A.*—Under the circumstances named, from fifteen to twenty minutes. Some builders of steam fire engines claim to be able to accomplish this in less than one-half the time. 6. I keep 6″ of my tubes covered with water; that is, there are 10″ in length not covered. Is that water enough, and does not the uncovered part of the tube get injured when getting up steam? *A.*—Water is carried low in boilers of this class so as to get up steam quickly. We think 6″ is about what would be carried to start with, where inch tubes are used. Write to the manufacturer of the engine for information on this point. The tubes do get injured, and if such boilers were used constantly they would last but a short time. 7. I calculate, with cylinders 9″x9″, 80 lbs. boiler pressure, and 120 feet piston speed, the horse-power is 15. Is that right? *A.*—We presume that with 80 lbs. boiler pressure you can get a mean effective pressure of 60 lbs. in cylinder. If so, the indicated horse-power will be about 13. 8. What is the name of the coal used in steam fire engines? *A.*—Cannel coal is generally used.


## Business Specials.

*Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.*

Mackenzie Cupolas and Blowers, 245 Broadway, N. Y.

SHAFTING STRAIGHTENERS—J. H. Wells, Tampa, Fla.

Springs—List free. T. F. Welch, 11 Hawkins st. Boston.

Presses & Dies, Ferracute Mach. Co., Bridgeton, N. J.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

Interchangeable work a specialty. Send stamp for new Lathe Catalogue. E. O. Chase, Newark, N. J.

For first-class machine patterns and estimates, address John Valentine, 15 Alling st., Newark, N. J.

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 86 John street, N. Y.

Fine tools and special machinery. Horace Thurston, 84 Clifford street, Providence, R. I.

Herbert W. T. Jenner, Mechanical Engineer and Solicitor of Patents, 632 F st., Washington, D. C.

Lyman's Gear Chart. How to lay out gear teeth. Price 50 cents. E. Lyman, C. E., New Haven, Conn.

Foot Power Machinery, for workshop use, sent on trial if desired. W. F. & John Barnes, Rockford, Ill.

The latest Improved Tack and Match Machinery is made by White Machine Co., Waterbury, Conn.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York.

Universal grinders for lathe-centers, chucks, angles, or cylinders. C. C. Hill, 84 Market st., Chicago, Ill

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

National and box chucks, foot and power lathes, and slide rests. Lodge, Barker & Co., Cincinnati, O.

Split Pulleys at low prices, and of same strength and Appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

DRAWINGS—Mechanical, electrical and Patent Office. All styles of artistic designing. Special facilities. Low rates. Wallace Metcalf, 140 Nassau St., N. Y.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

Improved Tack Machinery, made by The Willets Man'f'g Co., can be seen in operation at their works, 57 Clifford St., Providence, R. I.

The "Wax Process" Engravings shown in the AMERICAN MACHINIST each week are made by Struthers, Servoss & Co., 32 Frankfort Street, N. Y.

Difficult machines invented and built; coarse screws cut. V rotary files for fine milling, by mail 50 cts. Tower Machine Works, E. Brookfield, Mass.

Engine Lathes, Hand Lathes, and other fine tools. Assortment large; prices low. Frasse & Co, 62 Chatham St., N. Y.

The Complete Practical Machinist, $2 50; the Pattern Maker's Assistant, $2.50; Mechanical Drawing Self-taught, $4 00; books for practical machinists. Address, Joshua Rose, Box 3,306, New York City.

EXTRACTS FROM CHORDAL'S LETTERS, 400 pages, 12mo., handsomely bound in cloth. New and enlarged edition, with over 50 illustrations. Price $2. Published by John Wiley & Sons, 15 Astor place, New York.


## Manufactures.

M. S. Valentine, Richmond, Va., will erect a $20,000 manufactory in that city.

A $100,000 stock company is going to manufacture gas machines at Dallas, Texas.

The Ironing Machine Company, stock $50,000, has been organized at Paris, Texas.

The Texas Machine Company, stock $100,000, has been organized at Dallas, Texas.

James Mulvy will erect a $12,000 factory at 537 East Fifteenth street, New York.

Mary O'Neil, Yonkers, N. Y., will erect a six-story factory at 264 Broome street, New York.

The Ohio Valley Foundry Company, Bellaire, O., has been incorporated, with a capital stock of $30,000.

The Cambria Iron Company, Johnstown, Pa., have twelve Porter-Allen engines in use and have recently ordered two more.

The Waco (Texas) Woolen Mills will soon be in operation, and it is expected they will add largely to the prosperity of the city.

The new machine shops of the H. A. Ramsey Engineering Company, Baltimore, are expected to be ready for work in a few days.

The Fuller Block, of Jersey City, N. J. are about to put in two tubular boilers, 13-foot 9 inches long by 40 inches diameter, with thirty-three 3 inch tubes.

The Toledo, Ann Arbor, and Grand Trunk Railroad has purchased property in Toledo, O., with a view to building a round-house and machine shops.

A certificate of increase of capital stock, from $100,000 to $300,000, has been filed at Columbus, O., by the Mosler Safe and Lock Company, of Cincinnati.

The Cambria Iron Company, Johnstown, Pa,, has received an order from the Cincinnati, New Orleans, and Texas Pacific Railway for 15,000 tons of sixty-pound rails.

Frederick Loeser & Co., dry goods merchants, of Fulton street, Brooklyn, N. Y., have ordered three tubular boilers, 70-horse power each, and a 125-horse power engine.

The Revolution Tool Company, whose office is in Woonsocket, R. I., has completed a building at Revere, Mass., and commenced the manufacture of tools with a force of seventy-five machinists. Orders are now on hand sufficient to keep the works running one year.

L. S. Young, Thomas S. King, G. E. Blaine, and others, have organized the Blaine Center Draft Plow Company, to manufacture plows at Knoxville, Tenn. Capital $10,000.

New car-wheel works are to be built at Birmingham, Ala. Among those interested are C. C. Drake, of Detroit, Mich.; P. B. Warner, Covington, Ky.; and W. B. Seaton, Greenup, Ky.

John Wathey and J. G. Chadwick have purchased the Calera Iron Works, of Calera, Ala.; will improve facilities and turn out machine work generally.—*Baltimore Manufacturers' Record.*

A large amount of capital has been received at the Alabama State Bank at Birmingham, from New Orleans, New York, and London, for investment in iron, cotton, and wood manufacturing industries.

The Cleveland Screw Wrench Company succeed the firm of Campfield & Sutliff, Mr. Campfield retiring from the business in this city to start new wrench works at Sterling, O.—*Cleveland Iron Trade Review.*

The Risdon Iron Works, San Francisco, Cal, are building an addition to their shop room in the shape of a new boiler shop. The building will be 275 feet long, reaching through the whole block. It will be 45 feet wide and two stories high.

The Nashua (N. H.) Iron and Steel Company have recently manufactured and shipped four large steel shafts to Roach's shipyards, at Chester, Pa., designed for the new Government steel cruisers. They weighed over 70,000 pounds in the aggregate. More will follow.

The Crosby Steam Gage and Valve Company, of Boston, have just received an order for ten indicators for England, and eight for France, the springs and scales of which are to be graduated in kilograms. They have also an order from their London house for twelve.

The Central Stove Works, Keokuk, Ia., has been incorporated and will start up stove works in July, to employ sixty to seventy men. The officers are: President, A. J. McCrary; vice-president, Dr. S. F. Baker; secretary and manager, Gilbert Comstock; treasurer, Ed. F. Brownell; superintendent, J. W. Bishop.

A charter was issued June 4th to the Lackawanna Iron Company, with headquarters at Scranton, Pa. The capital stock is $100,000. Directors are: Joseph C. Platt, Charles F. Mattes, James S. Mott, Scranton; Percy R. Pyne, Benjamin G. Clarke, Samuel Sloan, Edwin Hatfield, Jr., William E. Dodge, Jr., New York City; John J. Blair, Blairstown, N. J.

The Gardner Governor Company, Quincy, Ill., write us: Notwithstanding the cry of hard times, we sold and shipped 2,589 governors the first five months of this year, an average of over 500 per month, and have orders now on our books for over 200 governors for July delivery. This is not a boom, but it far exceeded our expectations, and we have every reason to look for a steady increase now on.

J. S. Graham & Co., manufacturers of wood-working machinery, Rochester, N. Y., write us, under date of June 26th: We take this opportunity of notifying our customers and the trade generally, that we are not damaged to the extent that the local press and the Associated Press despatches reported. Our damage, by the fire on the 24th, was only by water, and we expect to be in full operation in five or six days.

The Pond Engineering Company, St. Louis, have been awarded the contract to furnish the pumping machinery for the Lexington, Mo., water works, which will consist of two Blake pumping engines, each having a capacity of 1,500,000 gallons per day, one will be a compound-condensing duplex engine, for continuous service, the other will be a non-compound duplex engine for reserve, with boiler-feed pump, heater, etc., complete. These engines will be required to work against a fire pressure of 140 pounds.

The Willets Manufacturing Company, 57 Clifford street, Providence, R. I. (tack and jewelers' machinery), write us: Although the general business of the country is very much depressed, we have been very much favored with orders the past six months, and at the present time have several months' orders on our books; notwithstanding we have put in several new tools to facilitate getting out the work. Inclosed find check to continue our advertisement, which we consider one of the secrets of our success.

We have before us a new illustrated catalogue of special tools for railway repair shops, manufactured by the L. B. Flanders Machine Works (Pedrick & Ayer), Philadelphia. Their machines are intended to supplement the regular tools used by all railroad shops, to facilitate work and make it less expensive. Quite a number of them are made, some of which have been illustrated in the AMERICAN MACHINIST. Lithographed letters from a number of prominent master mechanics are appended to the catalogue, testifying to the advantages of these special tools

The Great Western Railroad Supply Company have their works under way, and the side track from the belt railway, which will pass in front of their furnaces and through the mill and shops, is now graded. The works being outside the city limits of East St. Louis will escape taxation, except as regards the county, which has agreed to exempt them for ten years. In the matter of coal and transportation, the company figure out a saving of $100 a day when the works are running full, compared with the cost of operating such works on this side the river. Their coal, they say, will cost them 3½ cents a bushel less in East St. Louis than it would in St. Louis. They expect to have their heavy hammers engaged on shape work in about ninety days.—*St. Louis Age of Steel.*

## Machinists' Supplies and Iron.

NEW YORK, June 26, 1884.

There has been no improvement in the supply business during the past week, nor is any immediate change in the volume of business looked for. Manufacturers note no especial improvement in trade, although some report business up to the ordinary standard.

American iron continues in light demand, there being no intention of manufacturers to increase their supply beyond immediate wants. At the same time stocks in the hands of producers are light, so that any unusual demand will be quickly felt at producing centers. In prices, we quote: No. 1 X Foundry, $20 to $20 50; No. 2 X $18.50 to $19.50; Grey Forge, at furnace $16.50 to $17.

In Scotch pig transactions have been light, with sales of: Shotts, $21.50 to $21 75, to arrive; Coltness, $21 50, to arrive, $22 at yard; Glengarnock, $20 50 to arrive, $21.50 at yard; Gartsherrie, 21.50 to $22; Eglinton, $19.50.

## ✻WANTED✻

*"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.*

Mechanical draughtsman, with practical experience, wants a situation. Address "Competent," BOX 3, AM. MACHINIST.

An experienced foreman on specialties in iron and brass is open to engagement. First-class references. Address, BOX 14, AMERICAN MACHINIST.

Situation wanted, as foreman of a boiler shop. Have had 20 years' experience as foreman, and am conversant with marine stationary and locomotive work. Address George Marshall, care AMERICAN MACHINIST

For Sale—One No. 2 Brainard Universal Milling Machine, as good as new. Wells Brothers & Co., Greenfield, Mass.

For Sale—Accurate model of link and valve motion. Quarter size, nicely finished; worth $30, price $12. Address S, Box 71, Lima, O.

Wanted to Purchase—A full or partial set of Patent Office Reports—bound volumes, with index—must be in fair condition. Perkins & Co., Grand Rapids, Mich.

Engineers and boiler makers who wish to make a first-class dead weight safety valve, that cannot be tampered with, should address I. K. Mackenzie, 1831 Carpenter street, Philadelphia, Pa.

A first-class New York house, manufacturing improved sugar machinery, etc., desire a Chicago connection, for the sale of their goods on commission. With a good, reliable house, willing to push sales, a liberal arrangement would be made. Address S. S. & Co, office of AM. MACHINIST, New York.

To Draughtsmen, Engineers, etc.—A complete set of detail working drawings of a horizontal steam engine. Cylinder 10"x18", of the most approved modern construction, with perfect balanced, double ported slide valve. For price and particulars, address J. K. Mackenzie, 1831 Carpenter st, Phil'a, Pa.

Machine Shop for Sale—One-half interest in small machine and repair shop; all new tools, and in thorough order; situated within 35 miles of Philadelphia, and good facilities for shipping by rail or water. Price, $1,900. For particulars, address "Specialties," care AM. MACHINIST.

## SECOND HAND WOOD WORKING TOOLS.

We have **FOR SALE** a full line of wood working machinery, that has been in use but a few months, and is practically as good as new, Planers, Surfacer, Jointer, Moulder, with full set of Cutters, Circular Saws, Band Saw, Jig Saw, Pattern Maker's Lathes, &c. Also a twenty horse Engine and Boiler.

**BOEHM & CO.,**
633 to 637 N. Broad St., Philadelphia, Pa.

## AUCTION SALE.

Will be sold at public auction, at Wallingford, Conn., Wednesday, July 2d, 1884, at 10 o'clock A. M., the property of the Sweetland Manufacturing Company, consisting of tools, machinery, chucks, and parts of chucks; also the letters patent and patterns for "The Sweetland Chuck." For further particulars, address W. L. SWEETLAND, treasurer, 5 Elm street, New Haven, Conn.

FOR SALE, OR TO LET ON ROYALTY—A patent of merit, consisting of an ordinary caliper gauge combined with micrometer arrangement. The caliper is reliable, convenient for inside and outside measurement, from zero to any desired number of inches or fractions thereof. It can be manufactured cheaply; no special machinery required. Advertiser is a good machinist, has experience in manufacturing; would engage to work for the party, or would take partner with capital, to manufacture the caliper. Address

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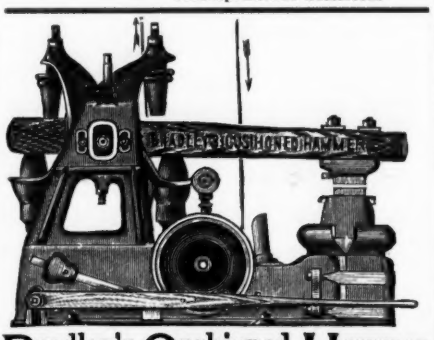


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Having Adjustable Speed, Automatic Safety Stop, Sawyer's Lever, and Solid Composition Valves and Seats. Also

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The following second hand Machine Tools, all in good order, and ready for immediate delivery:

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| One Engine Lathe, | 60"x25' 6", | triple geared. | Pond. |
| One " | 42"x14', | " " | Niles Tool Works. |
| Two " | 38"x15' 6" and 17' 6" | bed. | Pond. |
| Two " | 30"x15' and 18' 6" | " " | " |
| Two " | 28"x10' 6" and 17' 6" | " " | " |
| One " | 26"x12' | bed. | Niles Tool Works. |
| Two " | 24'x10' and 12' | bed. | Pond. |
| Four " | 20"x6' 8' 10' and 12' 6" | " " | " |
| One " | 18"x9' | " " | " |
| Three " | 16"x7' 8' 10' | bed. | Bridgeport Mach. Tool Works. |
| One Hand " | 16"x6' | | Pond. |
| One Planer, | 24"x24"x8' | | " |
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For further particulars, prices, &c., write to

**S. S. HEPWORTH & CO.,**
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N. Y. Office, 35 BROADWAY, Rooms 102 and 103.

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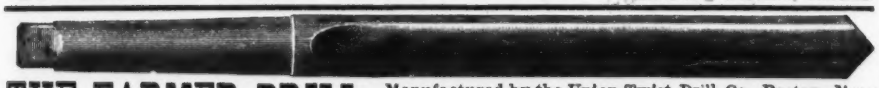

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James Boyd, 15 N. 4th St., Phila.
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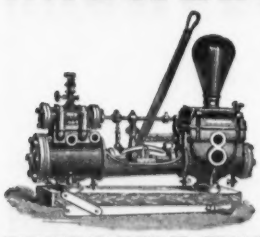
THE STANDARD!



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**PUMPING MACHINERY**
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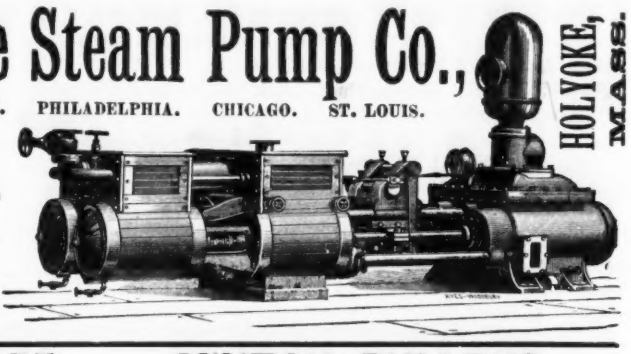

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The most economical, perfect, practical, simplest, cheapest, and elegantly finished Lubricators ever put on the market. One million sold within a couple of years. The **Barthel Solidified Oil or Lubricating Compound** is used with the **Lubricators** exclusively. Whoever has once tried this Lubricant will never again use oil or any other Lubricating compounds. Send for Illustrated Catalogue.

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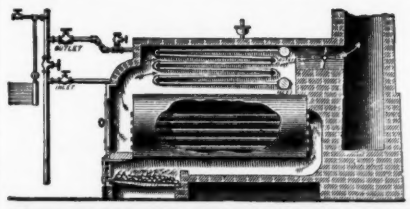

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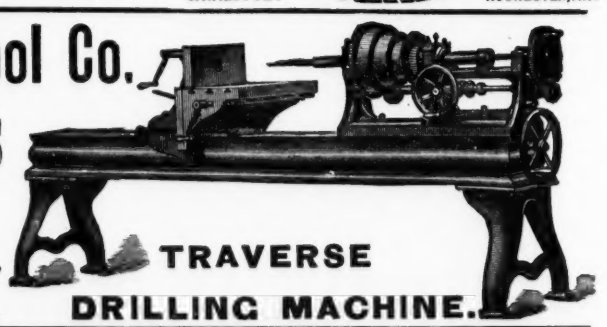

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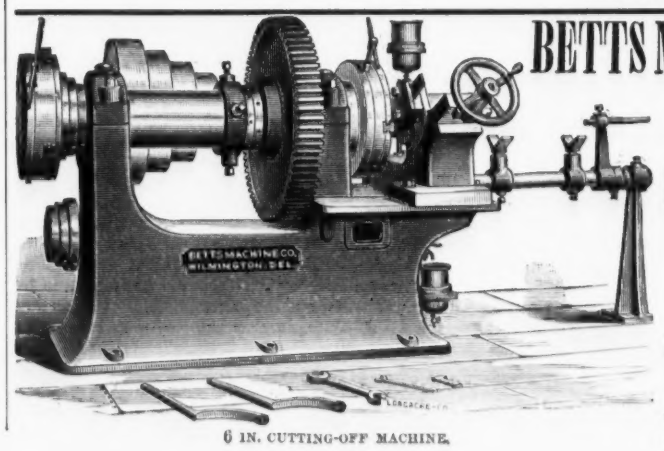


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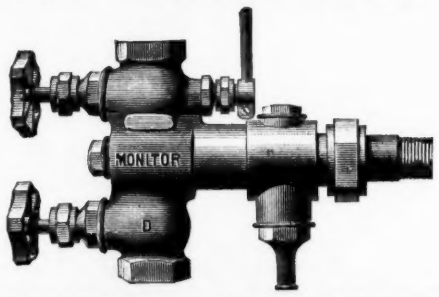


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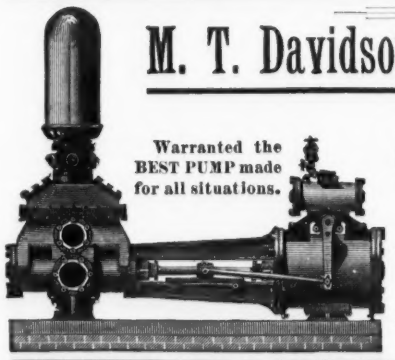

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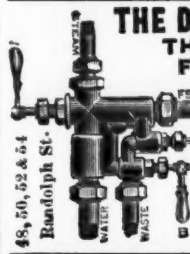


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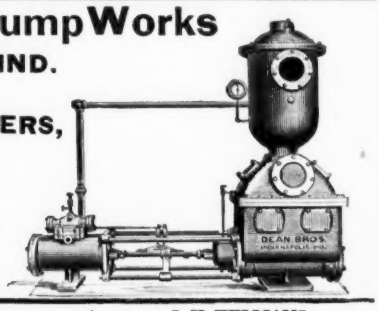


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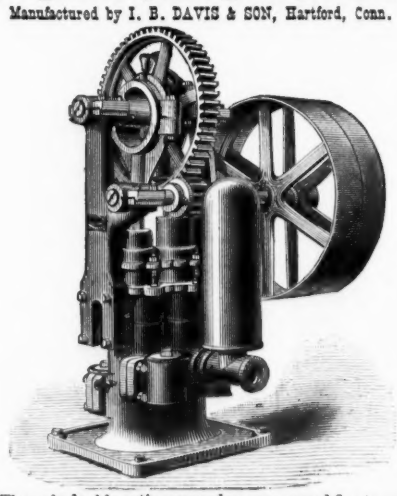

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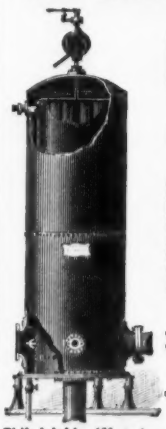

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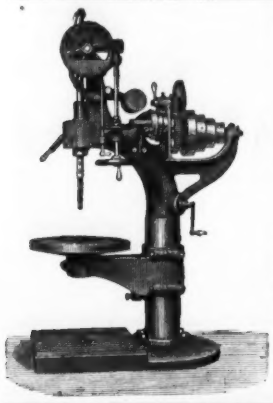

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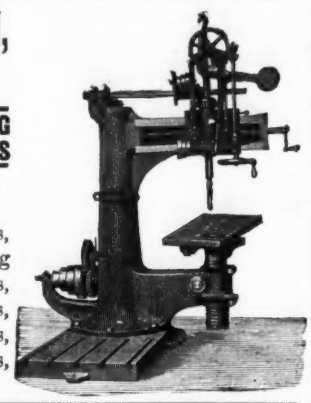

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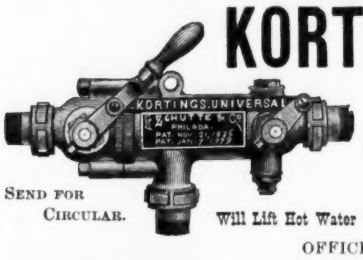


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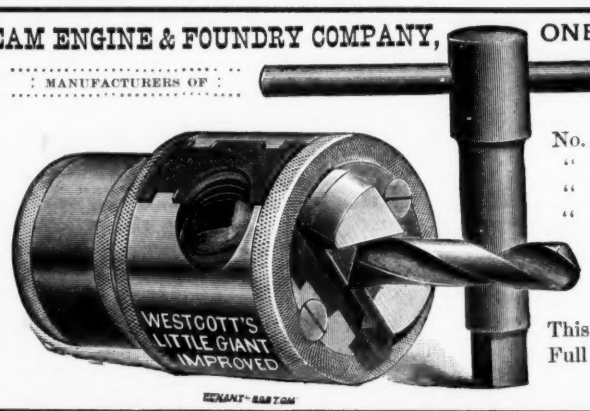


| HOLDING | |
|---|---|
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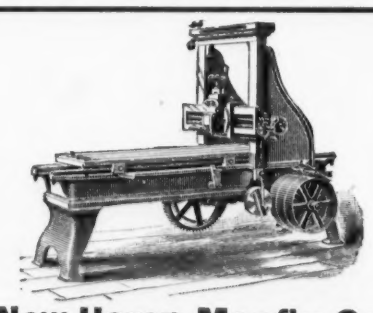

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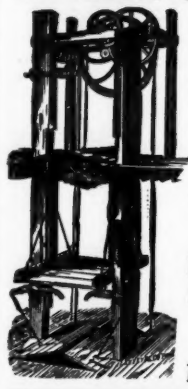

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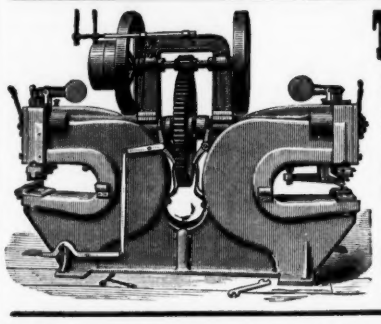

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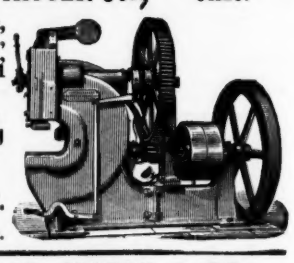

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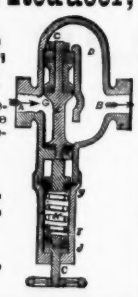

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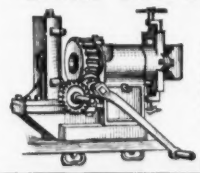

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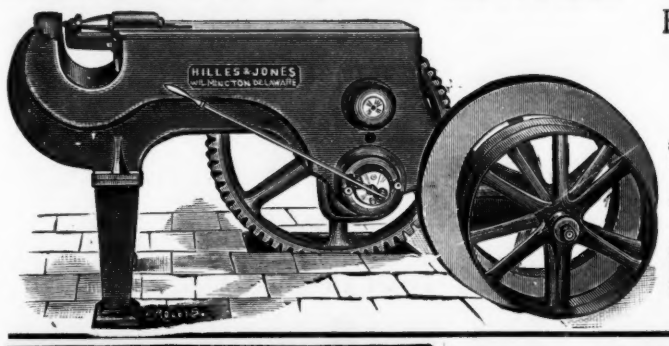


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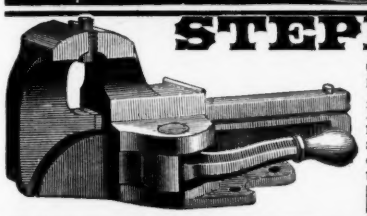

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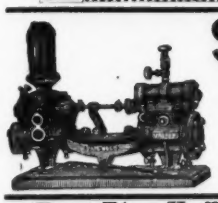

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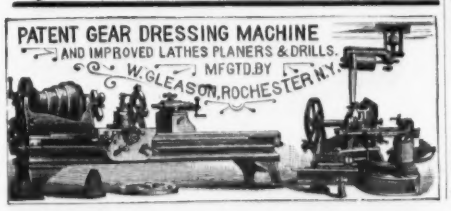


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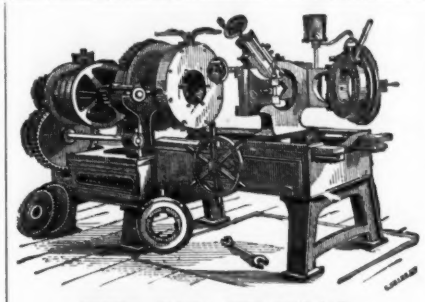

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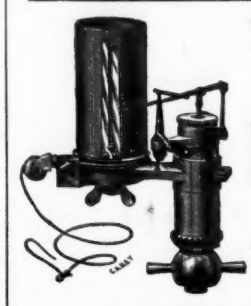

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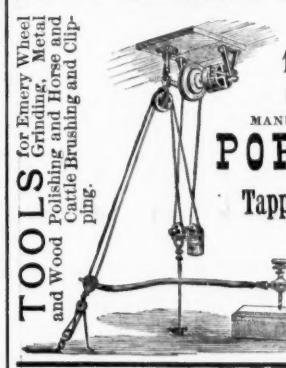

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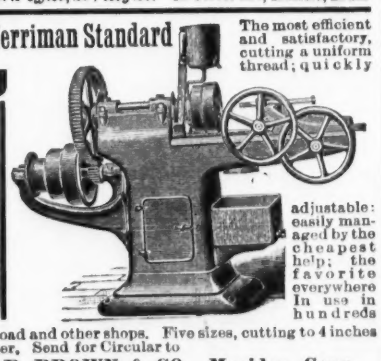

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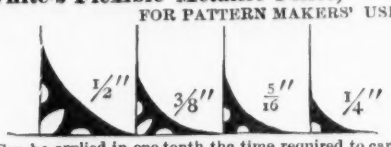


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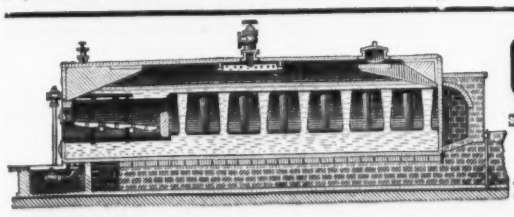

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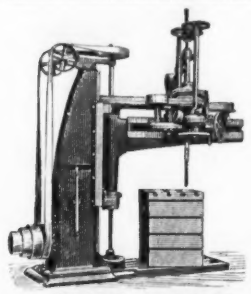

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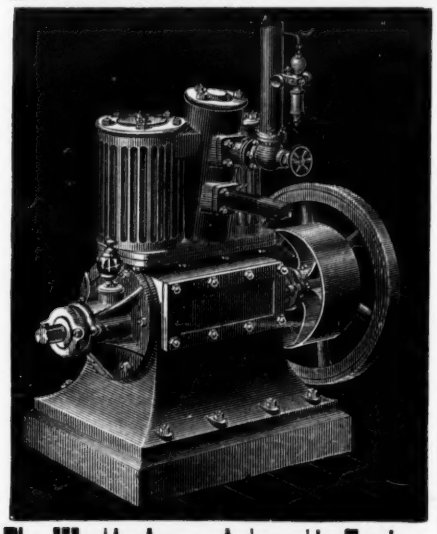

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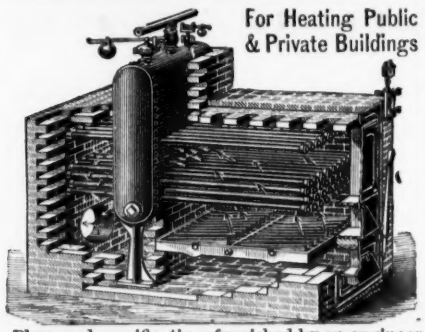

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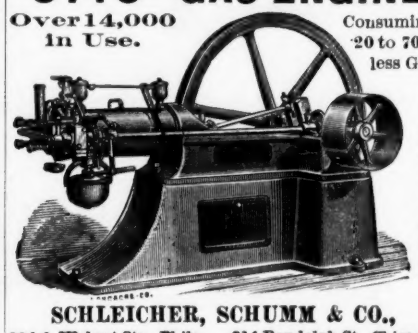

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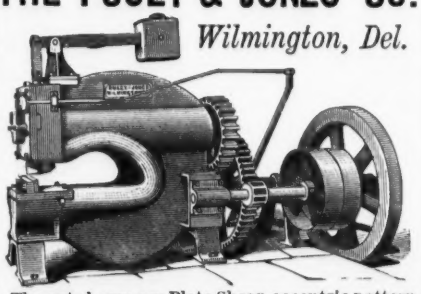

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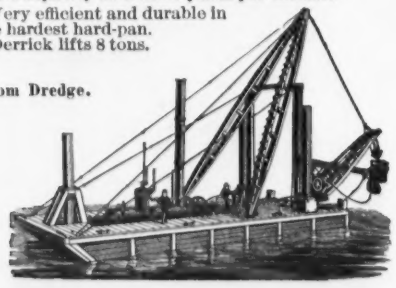

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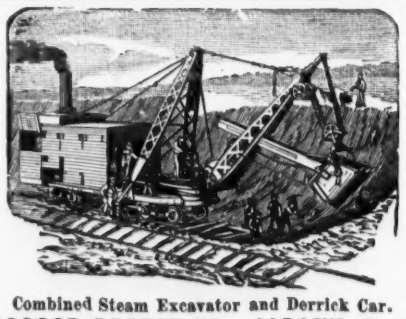

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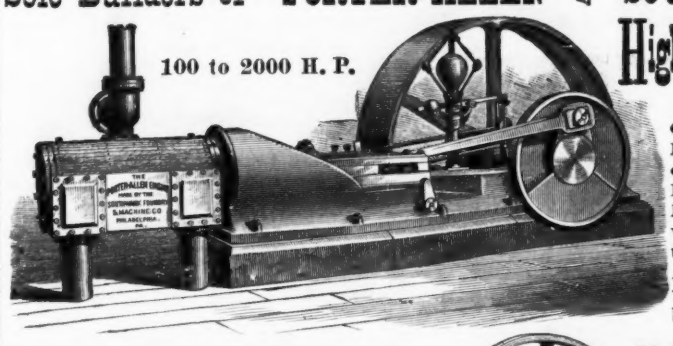

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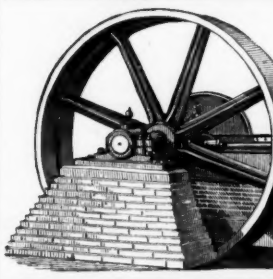

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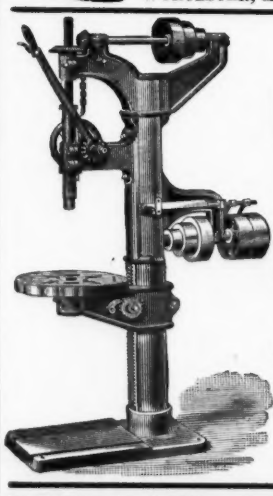

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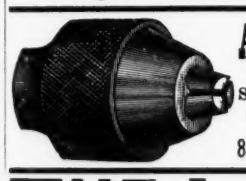

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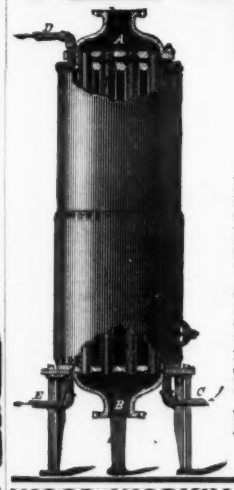

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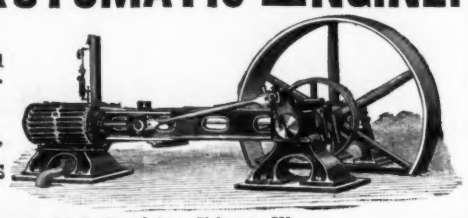

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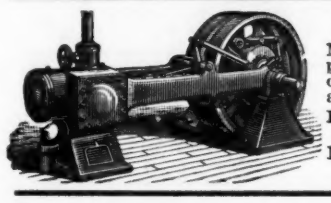

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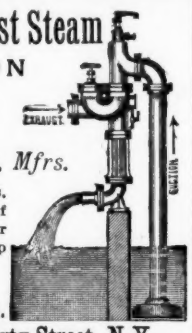


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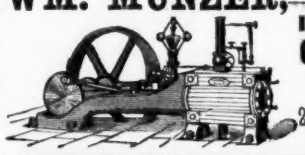

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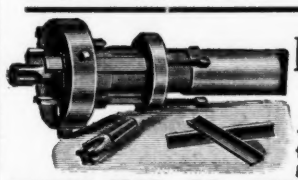

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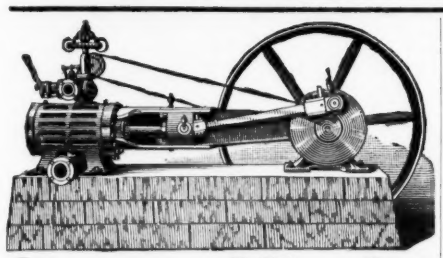

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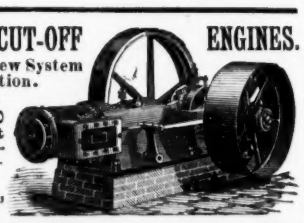

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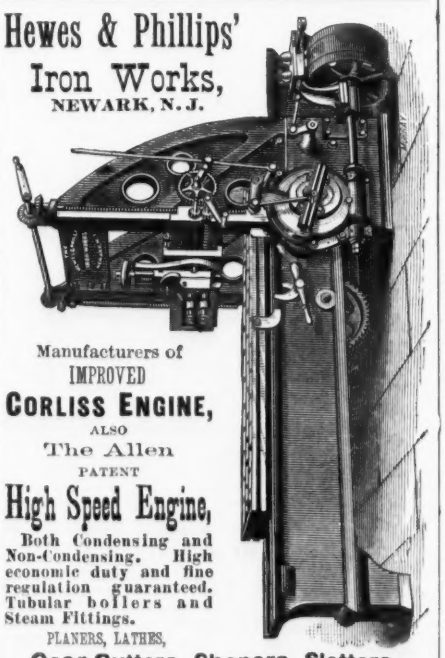

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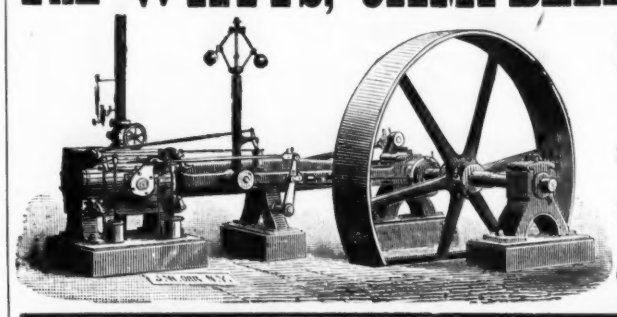

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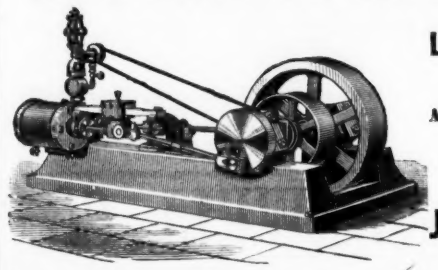

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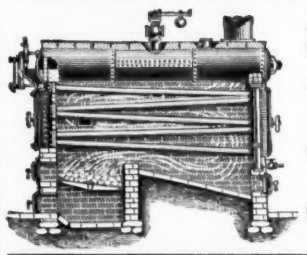

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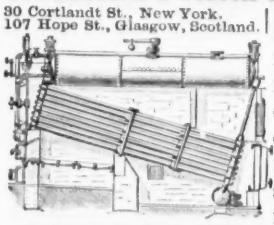

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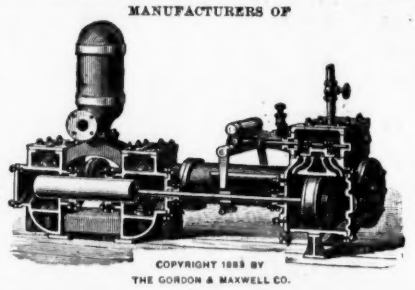

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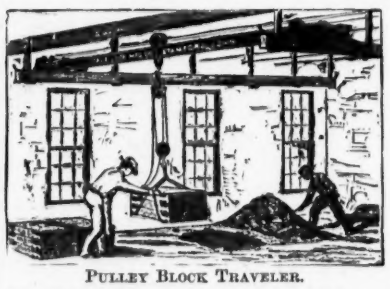

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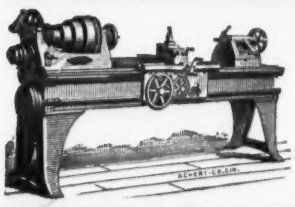

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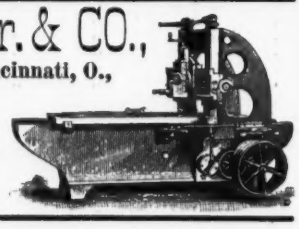

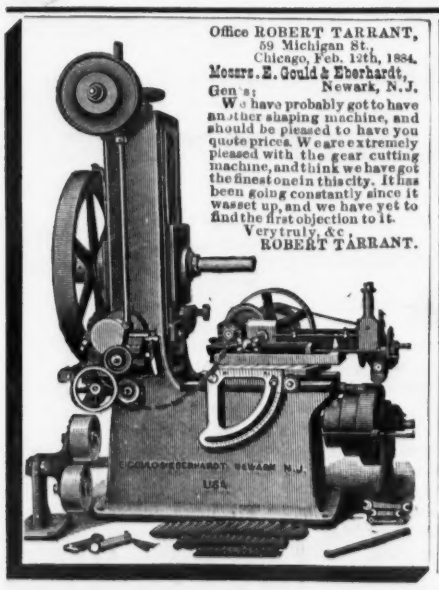

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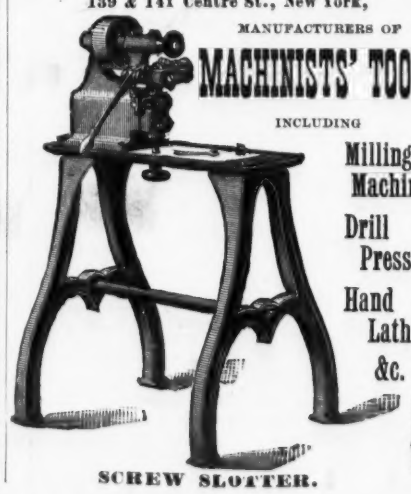

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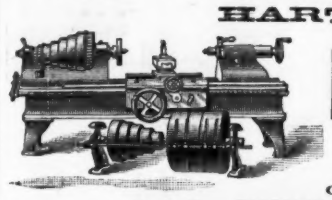

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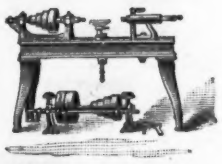

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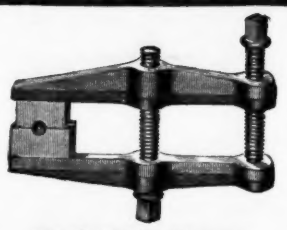

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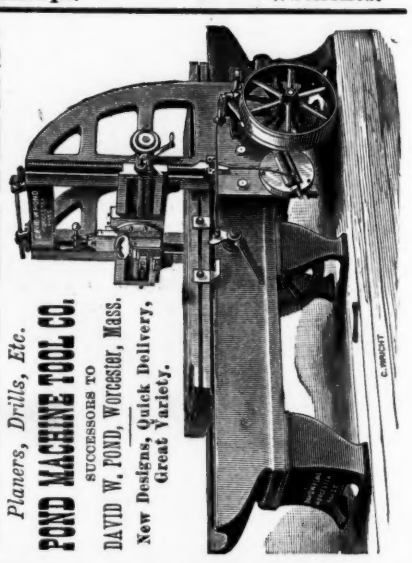

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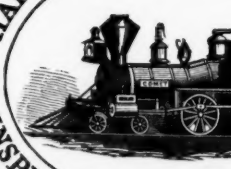

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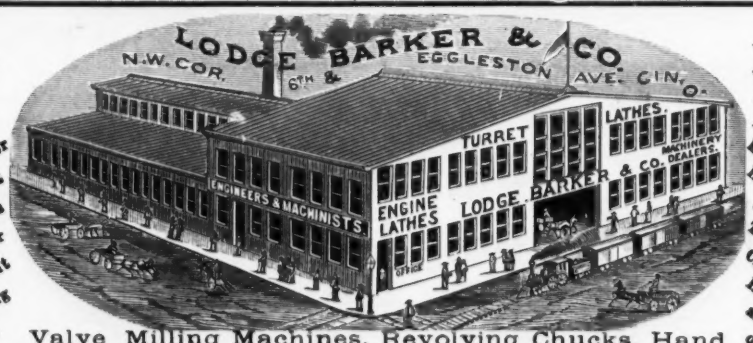


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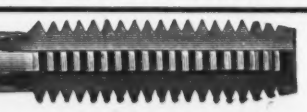

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